

HISTORY OF SCIENCE, TECHNOLOGY AND MEDICINE IN INDIA

INDIAN SYSTEM OF MEDICINE

O. P. JAGGI

VOLUME FOUR

HISTORY OF SCIENCE, TECHNOLOGY AND MEDICINE IN INDIA

VOL. IV

ĀYURVEDA : INDIAN SYSTEM OF MEDICINE

BY THE SAME AUTHOR :

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HISTORY OF SCIENCE, TECHNOLOGY AND MEDICINE IN INDIA

VOLUME FOUR

(Revised and Enlarged Second Edition)

ĀYURVEDA: INDIAN SYSTEM OF MEDICINE

By

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Preface to Second Edition

This completely revised, enlarged and reset edition incorporates the latest findings in the realm of ancient Indian medicine. The churning of the ocean of Hindu Medicine continues, throwing up wonders of medical wisdom that are being confirmed after elaborate research many centuries later, now.

Āyurveda considers merely the physical side of health quite inadequate and superficial. Health, by Āyurvedic definition, calls for a physiological, mental and emotional balance. Any disturbance in the balance is the root of disease. Through medicine we help to accelerate the process of healing by administering necessary antidotes. Herbs in their natural form help bring about their inherent balance of the patient.

Such Āyurvedic truth about the total health of human beings is being accepted and adopted, as Western medicine, with synthetic chemical drugs, is producing doubtful results in many cases. The revived interest in traditional Indian therapy makes this edition timely and relevant. May I hope my m dest attempt to explain the mythology, development and cardinal principles of Indian medicine in the modern context acts as a catalyst to further study and research. All medical systems are dedicated to the well-being of the mankind. Let the contribution of Indian medicine be properly evaluated and appreciated.

15th August, 1981 O. P. JAGGI

Preface to First Edition

Before the advent of antibiotics, a patient could not, with good reason, choose between Western Medicine, Indian Medicine, Unani Medicine or Homoeopathy. They all stood on the same pedestal, so far as bringing relief to the patient was concerned—unless it was a surgical patient, in which case Western Medicine had an edge over the others.

The situation has now changed. New diagnostic techniques, more effective drugs, and the marvels of surgery have weighed the scales in favour of Western Medicine.

Effectiveness of a system of Medicine, however, does not necessarily make it acceptable to a patient or a population group unless it fits in with their social and cultural beliefs.

Western Medicine does not fit in with the traditional beliefs of the vast majority of Indians, particularly the villagers ; they believe in and make use of Indian Medicine, the Āyurveda.

In the circumstances, it seems justifiable that every effort should be made to remove the shortcomings in Indian Medicine and make it as effective as possible, so that the people who have faith in it, can get the maximum benefit out of it.

Planned scientific research on different aspects of Indian Medicine is necessary so as (1) to remove the cobwebs that have gathered around it, (2) to assess it properly according to modern needs, and (3) to enhance its scope further by means of the material and methods now available to us.

A point is made frequently in certain quarters that Indian Medicine has remained static or in fact, deteriorated during the last two thousand years or so ; hence it not worth pursuing further. This is not true. Contacts with Greek and Arab Medicine refute this statement. After all even Western Medicine remained static from the second century to the sixteenth, a period of one and a half millennia. Indian Medicine needs encouragement because it is the system of medicine most acceptable to a majority of Indians.

It is hoped that the present volume will help in creating a scientific and rational awareness among people interested in Indian Medicine.

Part One of this book traces the origin and development of Indian Medicine in phases. It describes the history of its literature, the manuscripts and their authors. Part Two deals with the basic concepts and practices, medical education, personal and public health, anatomy, physiology, tridoṣa theory, causation and classification of diseases, diagnosis, prognosis, treatment, toxicity, medical jurisprudence and veterinary medicine. Part Three describes contacts of Indian Medicine with other systems of medicine, and the opinions of the foreigners. Such a comprehensive approach, it is hoped, will prove useful to a large number of readers.

Deepavali, 1972

O.P. JAGGI

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Abbreviations

A.H.	*Aśtānga Hridya*
A.S.	*Aśtānga Samgrah*
A.V.	*Atharvaveda*
B.D.H.M.	*Bulletin of the Department of History of Medicine, Hyderabad*
C.S.	*Charaka samhitā*
I.J.H.M.	*Indian Journal of History of Medicine*
I.J.H.Sc.	*Indian Journal of History of Science*
S.S.	*Suśruta samhitā*

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1

The Origin : Vedic Medicine

The art and science of medicine is as old as the mankind itself. Disease and injury have been part of our life and the measures taken to treat them coincided with the march of civilization.

As yet we know very little about the practice of medicine during the Harappā Civilization in India. In the absence of decipherment of the Harappā seals, a few snippets of information point out to the practice of primitive medicine at the time. A few medicinal finds which might have been used to treat patients are *śilajātu*, leaves of *neem* tree [*Azadirachta indica*], antlers of the red deer, etc. Skull bones into which holes had been drilled when the persons were alive (trepanning) have been recovered from the Harappā sites. Possibly they were the cases of first surgery on human body.

We are, however, better informed about the preventive aspects of medicine in this period. The discovery of an advanced drainage system, both inside the house and outside, with properly covered drains, toilets in the corner of the house, straight and wide paved streets in a planned township establish the awareness about sanitation and hygiene for healthy living among the Harappans.

It is possible that when the Harappan seals are deciphered, we know more about the curative aspect of medical practice of the period.

We are much better informed about the concepts and practice of medicine during the Vedic period. No medical text as such pertaining to early Vedic period is available. But the latter-day Vedic Samhitās, Brāhamanas and Upaniṣads throw light on the concepts of origin of life, birth, death, disease and suffering.

Two main sources of early medical knowledge are the *Rigveda* and the *Atharvaveda*. The *Kauśika sūtra*, the *Śatapatha Brāhmaṇa* and the various upaniṣads also contribute to knowledge. However, much of what we learn is a mixture of myth, legend and empirical knowledge and it requires proper screening to sort out valid facts.

The following account gives an idea about the concept and practice of medicine in this period. It also reveals the beginning of the Āyurvedic system of medicine.

Cosmic Nature of the Human Body

Through the ages, in India, the human body has been considered as the manifestation of divine energy. The principal forces and faculties which abide in the body, giving it life and supporting its processes, are considered microcosmic counterparts of the powers which pervade the cosmic body, the universe. Such a concept is witnessed in a variety of myths and speculations. An hymn in the *Rigveda* describes the origin of the universe from the body of a primeval being, the Puruṣa.[1] According to it, the gods, in the beginning of time sacrificed Puruṣa. As they divided him, his head became heaven, his feet earth, his ears became space, his eyes the sun, his breath the wind-god, and so on.

Another Vedic source describes that at the dawn of Creation, the divine guardians of the world spheres, *loka pālas*, emanated from the body of Puruṣa and entered as sense-faculties and life-forces of the human body. Fire became speech and entered the mouth, wind became breath and entered the nostrils, the sun became sight and entered the eyes, the quarters of space became hearing and entered the ears, plants and trees became hair and entered the skin, the moon became mind and entered the heart, death became breathing down (*apana*) and entered the navel, waters became semen and entered the male organ.[2]

The following hymn from the *Atharvaveda* describes this process more elaborately:[3]

> When (in the beginning of time) the Divine Craftsman drilled the apertures (which are the outlets for the sense faculties and vital processes. of the human body), the gods took the mortal for their house and entered man.

Sleep, forsooth, weariness, bane, the divinities evil by name, old-age, baldness, hoariness entered the body, one after another.

Theft, ill-doing, wickedness, truth, sacrifice, and great fame, strength and valour and force entered the body one after another.

Luck and ill-luck, increase and waning liberalities and illiberalities whatever there are, and all hungers and thirsts, entered the body, one after another.

Blaming and not-blaming and what is "Well" and "No", what is known and unknown, and what else is to be taught, entered the body one after another.

Delights, joys, enjoyments, laughing, dancing addressing and prating; breathing forward and breathing downward, sight and hearing, the indestructible and destruction, breathing asunder and breathing upward, speech, mind, entered the body, one after another.

Whatever waters there are and whatever divinities, the Lordly Power (of the Highest Being: Virāj), together with Brāhman (the Supreme Essence) entered the body: the Lord-Creator dwells in the body [as the generative principle].

The Sun took possession of the eye, Wind of the breath, each one as his own share [while the other forces of nature found their places in the organs and functions of the human body which correspond to them].

Then the divinities bestowed man's other [mortal] self [which is consumed on the funeral pyre] upon the Fire God.

Therefore, indeed one who knows man thinks 'this is Brāhman' [the divine principle manifesting itself in all forms and activities of the universe], for all divinities have their abode in man, as cows in a cow-pen.

The concept of *prāna*, the sustainer of life processes in the microcosm, human body, as well as in the macrocosm, the world, is well described in an hymn, sung in its praise in the *Atharvaveda*:[4]

> Reverence to *Prāna*, to whom all this (universe) is subject, who has become the lord of all, on whom the all is supported.
>
> Reverence, O *Prāna*, to thy roaring (wind), reverence, O *Prāna*, to thy thunder, reverence, O *Prāna*, to thy lightning, reverence, O *Prāna*, to thy rain.
>
> When *Prāna* calls aloud to the plants with his thunder, they are fecundated, they conceive, and then are produced abundant (plants).
>
> When the season has arrived, and *Prāna* calls aloud to the plants, then everything rejoices, whatsoever is upon the earth.
>
> When *Prāna* has watered the great earth with rain, then the beasts rejoice ; (they think) : strength, forsooth, we shall now obtain.
>
> When they had been watered by *Prāna*, the plants spoke in concert : 'Thou hast, forsooth, prolonged our life, thou hast made us all fragrant'.
>
> Reverence be, O *Prāna*, to thee coming, reverence to thee going; reverence to thee standing, and reverence, too, to thee sitting.
>
> Reverence be to thee, O *Prāna*, when thou breathest in, reverence when thou breathest out. Reverence be to thee when thou art turned away, reverence to thee when thou art turned hither ; to thee entire, reverence be here.
>
> Of thy dear form, O *Prāna*, of thy very dear form of the healing power that is thine, give unto us, that we may live.

Prāna clothes the creatures, as a father his dear son. *Prāna* truly is the lord of all, of that breaths, and does not breathe.

Prāna is death, *Prāna* is fever. The gods worship *Prāna*. *Prāna* shall place the truth-speaker in the highest world.

Prāna is Virāj (power, lustre), *Prāna* is Deshtri (the divinity that guides) : all worship *Prāna*. *Prana* verily is sun and moon. They call *Prana* Prajāpati (the Creator of all beings).

Rice and barley are in-breathing and out-standing. *Prana* is called a steer. In-breathing, forsooth, is founded upon barley, rice is called out-breathing.

Man breathes out and breathes in when within the womb. When thou, O *Prāna*, quickenest him, then is he born again.

They call *Prāna* Mātarisvan (that swells in the womb) ; *Prāna* forsooth, is called *Vāta* (the wind) the past and the future, the all, verity is supported upon *Prāna*.

The holy (*atharvana*) plants, the magic (*angirasa*) plants, the divine plants, and those produced by men, spring forth, when thou, O *Prāna*, quickenest them.

When *Prāna* has watered the great earth with rain, then the plants spring forth, and also every sort of herb.

Whoever, O *Prāna* knows this regarding thee, and (knows) on what thou art supported, to him all shall offer tribute in yonder highest world.

As all these creatures, O *Prāna*, offer thee tribute, so they shall offer tribute (in yonder world) to him who hears thee, O far-famed one.

He moves as an embryo within the gods ; having arrived, and being in existence, he is born again. Having arisen he enters

with his mights the present and the future, as a father (goes to) his son.

When as a swan he rises from the water he does not withdraw his one foot. If in truth, he were to withdraw it, there would be neither today, nor tomorrow, no night and no day, never would the dawn appear.

With eight wheels, and one rim, he moves, containing a thousand sounds (syllables), upward in the east, downward in the west. With (his) half he produced the world : what is the visible sign of his (other) half.

He who rules over this (all) derived from every source, and over everything that moves --reverence be to thee, O *Prāna* that wieldest a swift bow against others (the enemies).

May *Prāna,* who rules over this (all) derived from every source, and over everything that moves, (may be) unwearied, strong through the Brāhma, adhere to me.

Erect the watches in those that sleep, nor does he lie down across. No one has heard of his sleeping in those that sleep.

O *Prāna,* be not turned away from me, thou shalt not be other than myself. As the embryo of the waters, (fire) thee, O *Prāna,* do bind to me, that I may live.

In the above hymn, the devotee in paying homage to his own *prāna,* first adumberates it as the cosmic life-principle, the Lord of all, whose enlivening forces manifest themselves most impressively at the rainy season. Then from the macrocosmic aspect of breath, the hymn turns to its activity in man. It mentions that *prāna* maintains beings as a father does a son. But since it is the paramount principle of nature, it incorporates the negative as well as the positive aspects of existence. *Prāna* is regarded as the unity of antagonistic principles. It is *prāna* that enables man to live while in the womb, and to be reborn. The hymn then announces the reward

which is in store for the initiated who becomes aware of the power of breath and worships all its aspects, revering its very sound as perceived in its ceaseless rhythmical flow in his own organism and in the universal body. The hymn delves again into the secret nature of *prāna* as the supreme principle in man and the universe, enlarging on its different aspects. *Prāna* excels over the other divine powers which animate the human body as sense faculties and active 'agents'; for *prāna* alone partaking of the wisdom of Brāhma, remains unwearied and ceaselessly active, while the other tire and lie down, when man falls asleep. *Prana*, man's inner swan (a bird which freely wanders between the water below and air above), remains faithful to the abode it has chosen in man's body, and if properly honoured, it never withdraws completely though free to do so.[5]

Structure of the Human Body

There are many instances in the Vedic texts that deal with the structure of various parts of the human body. The observations, however, are rather rudimentary. The following hymn in the *Atharvaveda* in a general way refers to different parts of the human body.[6]

> By whom were brought the two heals of a man (*puruṣa*), by whom was his flesh put together, by whom his two ankle joints, by whom his cunning fingers, by whom his apertures, by whom his (two) *uchlakhaṣ* in the midst, who (put together) his footing.
>
> From what, now, did they make a man's two ankle joints below his two knee-joints above, separating his two back-things. Where forsooth, did they set him in, the two joints of his knees—who indeed understands that.
>
> There is joined, fourfold, with closed ends, above the two knees, the pliant trunk; that the hips are, the thighs—who indeed produced that, by which the body became very firm.
>
> How many gods (and) which were they, who gathered the breast, the neck-bones of man, how many disposed the two

teats, who the two collar bones, how many gathered the shoulder-bones, how many the ribs.

Who brought together his two arms, saying "he must perform heroism", what god set on his two shoulders upon the body.

Who bored out the seven apertures in his head – these ears, the nostrils, the eyes, the mouth, in the might of whose conquest in many places quadrupeds (and) bipeds go their way.

Since in his jaws he put his ample tongue, then attached (to it) great voice: he rolls greatly on among existences, clothing himself in the waters who indeed understands that.

Which was the god who (produced) his brain, his forehead, his hindhead, who first his skull, who, having gathered a gathering in man's jaw, ascended to heaven.

The following verse from *Śatapatha Brāhmana* gives direction for the construction of an altar in shape of a human figure. This indicates that an altar-maker was supposed to possess a fair amount of knowledge about human anatomy.[7]

The *trivrit* (stoma) is its head, whence that (head) is three-fold (*tri-vrit*)–skin, bone and brain.

The *pankadaśa* (fifteen-versed hymn-form) is the beck-joints—for there are fourteen of these (joints), and the vital force is the fifteenth; hence by means of that (neck), though being small, man bears heavy burden: therefore the *pankdaśa* is the neck.

The *saptadaśa* (seventeen-versed hymn-form) is the chest; for there are eight *gatru* on the one side, and eight on the other, and the chest itself is the seventeenth: therefore the *saptadaśa* (stoma) is the chest.

The *ekavimśa* (twenty-one versed hymn-form) is the belly, for inside the belly there are twenty *kuntapa*, and the belly is the

> twenty-first, therefore the *ekavimśa* (stoma) is the belly.
>
> The *trinava* (thrice-nine-versed hymn-form) is the two sides (*parśava*);—there are thirteen ribs (*parśu*) on the one side and thirteen on the other, and the sides make up the thrice ninth: therefore the *trinava* (stoma) is the two sides.
>
> The *trayastrimśa* (thirty-three versed hymn-form) is the spine ; for there are thirty-two *karukara* of that (spine) and the spine itself is the thirty-third : therefore the *trayastrimśa* (stoma) is the spine.

Following is the famous hymn of *Śatapatha Brāhmana* which gives the total number of bones in the human body. The relevant stanzas are as follows : [8]

> And there are three hundred and sixty nights in a year, and three hundred and sixty bones in man, and these (two) now are one and the same ;—there are three hundred and sixty days in the year, and three hundred and sixty parts of marrow in man, and these (two) now are one and the same.
>
> And there are seven hundred and twenty days and nights in the year and seven hundred and twenty bones and parts of marrow in man and these (two) now are one and the same.

The 360 bones are enumerated as follows : (1) heals, two in feet, (2) ankle bones, two, (3) digits, in pleural number, (4) metacarpal and metatarsal bones of hands, and feet, (5) base (*pratishtha*), (6) the knee caps, two, (7) the knee joints, (8) the shanks, two, (9) the pelvic cavity, (10) the thigh bones, two, (11) the breast bones, two, (12) the windpipe, in the pleural, (13) the breast, two, (14) the shoulder-blade, two, (15) the shoulder-bones, pleural, (16) the back bones, pleural, (17) the collar-bones, two, (18) the brow, (19) the central facial bone, (20) the pile of the jaw, the cranium with temples.

The *Śatapatha Brāhmana* mentions 26 ribs (*parśus*) which are fastened at either end to the thoracic vertebra at the back and anteriorly to the costal cartilages.[9] According to it, the vertebral

column has three subdivisions : (1) the cervical (2) thoracic and (3) the lumber.[10] Ideas about the structure of the heart are rudimentary. Heart is said to be of shape of lotus with nine openings in it.[11]

Some of the upaniṣads describe the heart rather elaborately. It is said to be made up of flesh with a net-work structure.[12] It is like the wheel of a chariot, the spokes of which are like arteries emanating from it, the number of which is variously described as 101[13] and 72000[14] [along with the sub-branches], which pass out from the heart through the pericardium, with which the heart is covered.[15] Its weight is described to be 8 *palas* (870 grams) in *Garbha Upaniṣad.*[16]

Other organs mentioned in the *Atharvaveda* are the lungs, bronchi, gall-bladder, kidneys, liver, stomach, intestines, colon, rectum, urinary bladder. Semen was considered as "the thread of life".

As regards its function, in a prayer it is requested, "O Mitra and Varuna, take away the thinking power [*chit*] from the heart.

There are many references to the different types of channels that convey different types of body constituents. The *Brihadāraṇyaka Upaniṣad* describes that there is the finest essence of food juice inside the cavity of the heart. It is this essence which by penetrating into the finest *nādis* serves to support the body. Heart is surrounded by a net-work of *nādis* and from it (food essence) rushes upwards through the extremely fine *hita nādis.*[17] The same *Upaniṣad* mentions that the *hita nādis* of the heart are as fine as a thousandth part of a hair and they carry white, blue, yellow and green liquids. The *Chhāndogya Upaniṣad* states that 101 *nādis* proceed from the heart.[18] The *Māṇḍukya Upaniṣad* also speaks in the same tune when it states that like spokes in a wheel, *nādis* are connected to the heart.[19] The *Praśna Upaniṣad,* however, states that *vyana vāyu* (air) flows through 100 *nādis* connected with the heart.

The *Maitrāyaṇi Upaniṣad* mentions of a *sushumnā nādi* proceeding upwards towards the head through which flow *prāṇa.* The *Atharvaveda* mentions of two *gavinyān nādis* which carry urine from the kidneys to the bladder.[20] The words *dhamani* and *śira* have also been used on different occasions to denote the same meaning as *nādi* but it is difficult to assign a particular specific and different meaning to each of these terms.[21] In certain references the term *dhamani* has been used to denote a larger channel than

the other two.

It was observed that the contents of the channels moved. A verse in *Atharvaveda* states: "Who stored in him floods turned in all directions moving diverse and formed to flow in rivers, quick, rosy, red and copper dark, running all ways in a man upward aud downward".[22]

Diseases and Their Treatment

Generally speaking, different diseases, even accidents, were attributed to super-natural causes. Committing a sin in the present or even past life, transgression of the normal divinely-prescribed course of life, disrespect to gods, and the witchcraft of the enemies were some of the major factors that led to different diseases. Different gods, singly or collectively, by themselves or through the agency of various demons, made man suffer for the wrongs he did. Hereditary diseases were considered to be caused as a result of the sins committed in the past life by patient himself or by his parents.

Varuna, the cloud god could cause many diseases, but the one particularly attributed to him was dropsy, i.e., the swelling up of the whole body. Rudra's special way of inflicting illness was to shoot arrows at the victims, thus causing acute pain.

Takman was the god that caused fever.

While many of the symptoms themselves were considered as diseases, for example, dropsy, jaundice, retention of urine and cough, combinations of symptoms in a patient led to the diagnosis of a particular disease. Fevers that occurred on particular days, or those occurring continuously, diarrhoeas of varying severity; consumption, leprosy, epilepsy, madness, are some of the diseases frequently mentioned in the *Atharvaveda.*

Fevers of different kinds seem to have been a common ailment. There were fevers preceded or accompanied by cold, or marked by a burning sensation all over the body, or occurring every alternate day, or leaving two afebrile days in between. Some fevers were accompanied by jaundice, and some others by cough and consumption. Some occurred on'y in the summer or in the autumn, and some others throughout the year. A very interesting observation from epidemiological point of view is that the regions named as Gandhara, Mahāvrisa, Maunjavan, and more particularly Balhika (Balkh) were

regarded as the home of all sorts of fevers.[23]

In the *Rigveda* the mythical Aśvins were called the divine physicians.[24] They had remedies against various diseases.[25] They could even ward off death.[26] Their devotees reached old age with bright eye-sight and were blessed with riches and lots of children.[27] In the mythical account of their marvels, it is said that they could restore youth to the old. The debilitated body of the sage Chyavana was fortified with youth and made desirable to his wife again by the Aśvins.[28] In the same way they also invigorated aged Kāli.[29]. Sage Rebha, after being stabbed, was hidden under the waters for ten days and nights, when the Aśvins pulled him up and revived him to health. They saved Vandana from a calamity, drew him out of a pit where he had been hidden away as dead and restored him to normal life.[30] They saved Sage Atri Sapta-vadhri who, along with his companions, was thrown in the burning fires by a demon. They restored eye-sight to Rijrasva who had been blinded by his father because he had killed his father's hundred and one sheep to quench the appetite of a she-wolf.[31] They provided an iron leg to Viṣpalā, wife of Khela king, whose own leg had been cut off in a battle.[32]

In the *Atharvaveda* are mentioned the procedures adopted to cure different diseases. They include incantations, charms, amulets, and herbs, both for external and internal use.

For the long life of a boy, the parents prayed thus :

> For thee alone, O (death from) old age, this (boy) shall grow up: the other hundred kinds of death shall not harm him ! Like a provident mother in her lap, Mitra shall befriend him, shall save him from misfortune! Lead this dear child to life and vigour, O Agni, Varuna and King Mitra ! As a mother, afford him protection, O Aditi, and all ye gods, that he may attain to old age ![33]

A cure was countered by a curse. A curse would be induced by giving a white lump of earth to a dog, an amulet tied to the cursed person, an oblation poured, or faggots of a certain plant consigned to fire,[34] and the following verse chanted:[35]

> The thousand-eyed curse having yoked his chariot come hither,

seeking out him that curses me, as a wolf the house of him that owns sheep.

Avoid us, O curse, as a burning fire (avoids) a lake! Strike here him that curses us, as the lightning of heaven the tree !

He that shall curse us when we do not curse and he that shall curse us when we do curse, him do I hurl to death as a bone to a dog upon the ground.

In order to cure dropsy, the following hymn mentioned in the *Atharvaveda* was recited to propitiate Varuna:

The golden chamber, King Varuna, is built in the waters.

Thence the king that maintains the laws shall loosen all shackles.

From every habitation (of thine). O King Varuna, from here do thou free us: If 'O waters, inviolable ones', if 'O Varuna' we have said, from this (sin) O Varuna free us......

Loosen from us, O Varuna, all fetters, the uppermost, the nethermost and those imposed by Varuna! Evil dreams and misfortune drive away from us: then may we go to the world of the pious.[36]

Besides the chanting of the hymn, a few rituals were obligatory for effective treatment. A hut was built at the confluence of two rivers. The dropsical patient was placed in this hut. An offering was made while the prayer was being recited. Then the patient was washed with the help of three bunches of grass, dipped in water.[37]

In order to get relief from the pain caused by Rudra's arrows, the following incantation was sung :

The arrow that Rudra did cast upon thee, into (thy) limbs and into thy heart, this here do we draw out away from thee.

From the hundred vessels which are distributed along thy limbs,

from all of these do we exercise forth the poisons.

Adoration be to thee, O Rudra as thou casteth (thy arrow); adoration to thee (arrow) when it has been placed upon (the bow); adoration to it as it is being hurled: adoration to it when it has fallen down.[38]

In order to get relief from fever caused by Takman, the following verses were recited:

When Agni having entered the waters, burned, where the (gods) who uphold the order of (the universe) rendered homage (to Agni), there, they say, is thy origin on high; do thou feel for us and spare us, O Takman:

Whether thou art flame, whether thou art heat, or whether from licking chips (of wood), thou hast arisen. Hrudu by name art thou, O god of the fiery, do thou feel for us, and spare us, O Takman:

To the cold Takman, and to the deliriously hot, the glowing, do I render homage. To him that returns on the morrow, to him that returns for two (successive) days, to the Takman that returns on the third day, homage, shall be.[39]

In the following hymn, Takman is propitiated as a god and then rebuked and asked to go away and live in the frog.

Homage (be) to the deliriously hot, the shaking, exciting, impetuous [Takman]! Homage to the cold (Takman), to him that in the past fulfilled desires ! May (the Takman) that returns on the morrow, he that returns on two (successive) days, the impious one, pass into this frog.[40]

To treat obstruction of urine and stool, the patient was made to drink water out of a rat's hole, or a certain plant, or saw-dust from old wood. He was made to ride an elephant or a horse, and to shoot an arrow. A fine iron needle was then passed through the

urethral canal. The following verse was then chanted:

> I open your urinal path like a canal through which the waters rush. So may the urine come out with a whizzing sound.[41]

In order to stop bleeding and to check the flow of blood after an injury, the incantation recited was:

> The maidens that go yonder, the veins, clothed in red garment, like sisters without a brother, bereft of strength, they shall stand still.[42]

At the bleeding spot a handful of dust was applied or bandaged over.[43]

The treatment of jaundice consisted of imparting the redness from the red objects and animals, preferably a red bull, to the patient. An elaborate ritual had to be undergone. An amulet consisting of a piece of bull's skin, soaked in cow's milk and anointed with the dregs of *ghee*, was tied around his neck. He was to drink milk and eat prescribed foods. The following hymn was recited:

> Up to the sun shall go the heart-ache and thy jaundice: in the colour of the red bull do we envelop thee !
>
> We envelop thee in red tints, unto long life. May this person go unscathed and be free of yellow colour:
>
> The cows whose divinity is Rohini; they who, moreover, are (themselves) red (rohinih)—(in their) every form and every strength we do envelop thee.
>
> Into the parrots, into the *ropanakas* (thrush) do we put the jaundice, and furthermore, into the *haridravas* (yellow wagtail) do we put thy jaundice.[44]

It is prayed that may the red colour of sun and the bull enter the patient's body and the yellow colour of jaundice go to the birds of yellow colour.

In a charm against various diseases owing to infestation by worms, the priest, while uttering the incantation, held dust in his left hand and pressed it with his right hand, and then threw it on the patient.[45]

The worms are described as visible and invisible. Some of them are called *algandu* and others *saluna*. They generate in the intestine, head and heels, and go about through the body, and cannot be killed even with different kinds of herbs. They sometimes reside in the hills, and forests, in herbs and animals, and they enter into the body and through sores in our body and through various kinds of food and drinks.

In another charm against worms, the patient is given the juice of the twenty different kinds of roots.[46]

The hymns not only describe an empirical or perhaps rational treatment but also give a very good description of the worms that infest the intestine and other parts of the body. The knowledge that they enter our body through food and drinks is highly creditable as a scientific fact.

In order to treat leprosy, the priest-doctor chanted the following hymn addressed to a dark coloured plant, to drive away the white spots.

> The leprosy and the gray spots drive away from here - may thy native colour settle upon thee—the white spots cause to fly away! The leprosy which has originated in the bones and that which has originated in the body and upon the skin, the white mark begotten of corruption, I have destroyed with my charm.[47]

A verse describes the application of an ointment made up of cow-dung and different herbs on those white spots until they turn red.[48]

Against hereditary leprosy (that appeared in early childhood), an amulet consisting of *arjuna* wood, barley, sesamum and its flowers was tied on the patient.[49]

Another amulet for the same disease contained the horn of a deer.[50]

In a mad and maniac patient who shouted wildly and who is 'bound and well-secured', Agni is invoked to calm down his mind which has been maddened by the sin of the gods or been robbed of

sense by the demons. It is further prayed, "May the Apsaras restore thee, may Indra, may Bhaga restore thee, may all the gods restore thee, that thou mayest be freed from madness".[51]

For eye diseases, patient was given different kinds of vegetable leaves fried in oil;[52] for helping the growth of hair on the head, the hair was sprinkled with a decoction made up of different herbs;[53] a consumptive was asked to eat rotten fish;[54] for virility the root of a (*kapittha*) tree boiled in milk was given for drinking; for poisoning due to some vegetable, the essence of a (*krmuka*) tree was given for drinking.[55] For conception,[56] for causing sterility,[57] for conceiving a son,[58] for preventing miscarriage,[59] and for easy delivery,[60] there are verses and formulae in the *Atharvaveda.*

Following is a verse that a sick man should chant himself.

> O Soma and Rudra, eject asunder the disease that has entered our household, drive far to a distance perdition any committed sin put away from us. O Soma and Rudra, do ye put all these remedies in our bodies, unite, loosen from us what committed sin may be bound in our bodies.[61]

Evil omens that come in the form of pigeons, owls and black birds or evil dreams were warded off by reciting verses and wearing amulets of pearl, shell, etc. At night a person was thought to be very susceptible to being over-powered by evil spirits; so he prayed thus before going to bed:

> O Night, the earthly space hath been filled with the father's orderings, great thou spreadest thyself to the seats of sky: bright darkness comes on...uninjured may we, O wide darksome night, attain thy further limit.... Let no darksome night, attain thy further limit, no demon, [no] mischief-plotter master us; let no evil-plotter master us.[62]

Herbals in the Cure of Disease

Plants and their products formed part and parcel of the practice of medicine in Vedic times. Quite often their use in different diseases appears to be rational based upon proper understanding of their

action and effect; but more often it is just empirical based upon the previous experience of their having been found useful in similar conditions.

Different plant products were not only prescribed to be taken internally or applied externally, but also amulets made out of them were worn. Vedic Aryans were familiar with hundreds of different plants that were useful either singly or in combination with others, in different diseases. They revered them, propitiated them and also actively cultivated them so that they may be available abundantly.

In the following incantation in the *Rigveda*, the physician (*bhisaja*) praises such medicinal plants, ascribes a hundred-and-seven virtues to them and requests them to help him cure the patient.[63]

These herbs, the first-born of the gods,
three ages of the world age,
these will I worship in my thought
the hundred-and seven virtues of these
(with new) tawny (sprouts).

Hundred, O mothers are your virtues,
and thousand, your shoots,
ye, of hundred potencies, then,
make me hale this man.

Rejoining, herbs, respond,
Ye with flowers, ye with shoots,
like mares, winning the race
eager, the plants to ferry over to the side of safety.

Herbs :—thus I address you, mothers, goddesses,
may I win horse, cow, clothes,
...thy life-spirit (*atman*), O man !

In the *Aśvattha* (tree) your seat,
your abode made in its leaf
ye like milking cows would be
when you better me this man !

With whomever the herbs have come together
like kindly chiefs unto the gathering,
that Brahmana is called a 'healer' (*bhiśaja*),
a demon-killer, a disease-dispeller.

The rich in mare-like waters, the rich in *Soma*,
the invigorating, the one excelling in strength :
all herbs found I for this man
to free him from harm.

Like cows from the cow-pen,
stream forth the virtues of the herbs,
eager to secure rich fee (for me).
(for thee) thy life-spirit (*atman*), O man !

Weal-working is your mother's name,
hence you are woe-expellers.
Winged streams are you :
you expel what ails.

Over all enclosures they have climbed
like a thief into the cow-pen.
The herbs have driven away
all defects of the body whatever.

Since, strength-imparting, I hold
in my hand these herbs,
the life-spirit (*ātman*) of consumption vanishes,
as if in front of Him who seizes the life-soul
(Yama, king Death).

Whom, herbs, you crawl along,
limb by limb, joint by joint,
from him consumption you divide asunder,
as, located-at-the-center,
the mighty (king divides asunder
the ring of neighbour kings who
prey upon his realm).

Fly away, consumption, together with the jay,
with the blue jay,
with the blast of the wind
with the storm, vanish !

One of ye help the other,
one to the other be helpful,
ye all, of one consent,
help onward this my spell.

Those with fruit, those without fruit,
those flowerless and those with flowers,
impelled by the Lord of Magic Spells (Vrihaspati),
may they deliver us from ill.

May they deliver me from imprecation
and from (the dropsy), that comes from Varuna,
and from the Tamer's fetterlock (sickness unto death),
from all god-sent diseases.

Flying down from heaven the herbs spake :
whom, alive, we reach,
that man does not perish.

Whatever herbs there are in *Soma's* kingdom,
the many, wise a hundred-wise.
Of these thou are the best
ready to desire, weal to the heart.

Whatever herbs ye be in Soma's kingdom,
spreading earth-wide,
impelled by the Lord of Magic Spells,
lay your strength together in this herb.

May he not come to harm who digs you ;
nor he, for whom I dig you ;
our two-footed, our four-footed
all uninjured be.

Whatever plants hearken to this spell,
and those gone out of reach,
all flocking here together,
shall give their strength together in this herb.

The herbs consult with Soma, with their king:
'For whom a Brahmana works a charm
him O King, we ferry over to the side of safety'.

Thou art the best, O herb,
the trees to thee are servants;
Be subservient unto us.
He, who seeks to do us harm.

In this incantation, all existing herbs are invoked to lend aid. They are blended into an arcanum to conquer consumption, the wasting disease. The herbs are propitiated and also appeased for being uprooted. The high cost of the medicinal preparation and the deep knowledge of the physician is emphasized upon. His closeness to the healing divinities is publicised. Lastly, after the administration of the drug, it is forcefully suggested that "the herbs have driven away all defects of the body whatever".[64]

The following long hymn in the *Atharvaveda* was chanted when out of the many herbals, a medicine is prepared for a patient suffering from consumption (*yakshma*).[65]

These that are tawny that are bright,
the red and the spotted,
the swarthy, the black herbs,
all do we conjure hither.

Let them save this man
from consumption sent-by-the-gods,
these plants, fathered by Heaven, mothered by Earth,
whose root is the primal cosmic ocean.

The divine herbs in the beginning were the primal waters
they have made depart from thee, from every limb,

they sin-born consumption.

The spreading, the bushy, the one-spathed,
the extending herbs, I conjure hither,
those with shoots, those with joints, those with
spreading branches,
I call for thee the plants that are of all gods,
mighty, life-giving unto man.

Whatever power is yours. ye powerful ones,
whatever valour and strength is yours,
therewith free ye this man from this consumption.
O herbs, Now do I make a remedy.

The lively, by-no-means-harming, living herb,
the non-obstructing. upward-leading,
nourishing flower, rich in sweets,
do I call hither,
to make this man free from harm.

Hither shall come the forethoughtful ones,
the allies of my spell,
that we may safely ferry over this man from Distress.

Food of Fire, from the womb of waters.
growing up renewed, firmly rooted, named a
thousand names,
be they remedial in being brought.

With *avakā* (*Blyxa octandra Rich*) as their full
with the waters as their nature
May the sharp-horned herbs rend distress asunder.

These that release, dispel *varuna* (dropsy),
the mighty, the poison-destroyers,
the swelling-dispellers as well,
the spoilers of witchcraft,
may these herbs come hither !

The purchased, and praised, most powerful plants,
May they protect in this village
Cow, horse, man and beast.

Rich in sweets the root, rich in sweets the tip,
rich in sweets has grown the middle of these plants ;
rich in sweets the leaves, rich in sweets the flowers of these
partaking of honey, drink of the elixir of Immortal life (*amrita*).
May they milk forth melted butter, food,
and first of all, milk.

How many and whatsoever be these herbs upon the earth
May that, the thousand-leafed,
release me from death, from peril.

May the tigerish amulet of plants,
protecting, guarding against imprecations,
smite far from us diseases and all demons.

As at the lion's roar,
they start with fear,
as at fire, they start fearing the herbs brought hither ;
May consumption of kine, of men, be gone,
driven out by the plants, beyond the navigable streams.

Herbs, released from the fire who-dwell-with-all
men (*Vaisvanara*),
go ye stretching over the earth,
ye whose king is the forest-tree.

Those herbs, related to the Angirases (the semi-divine first
Brahmanas),
which grow on mountains and plains,
may they be rich in milk, propitious,
weal to our heart.

Those plants I watch, those with the eye I see,
the unknown and the ones we know of,

and these in which we wit the virtues brought together.

May all herbs together note my spell
that we may safely ferry over this man out of distress.

The *asvattha* (tree, *Ficus religious Indica*), the *darba* grass
(*Sacchorum cylindricum*),
Soma, the king of plants, oblation, the immortal dish,
rice and remedial barley, ye twain immortal sons of Heaven.

Rise ye up ; it thunders and roars at (you), O herbs,
when Parjanya (the god of rain) favours you with seed,
O ye children of the spotted Cow (the earth).

Of this divine elixir of immortal life (*amrita*),
we make this man drink strength ;
now I do make a remedy,
that he come to a hundred years.

That plant the boar knows,
that remedial herb the mongoose knows,
(the genii of the *amrita*-containing
moon cup, guardians of the vegetative lunar cycle),
those I call to his aid.

Whatsoever herbs, related to the Angirases, the eagles,
whatsoever divine one the bees (?) know.
Whatsoever the birds, the swans know, and all winged ones,

Of however many herbs the inviolable kine eat,
Of however many the goats and sheep,
May all these herbs, brought hither,
extend protection unto thee.

In however many herbs the human physicians find a remedy,
So many, all remedial, do I bring unto thee.

Those rich in flowers, rich in shoots

rich in fruits, these fruitless ones as well,
like mothers assembled, let them yield milk
upto this man for freedom from harm.

I have snatched thee away from the Him-with-the five-stings,
and from Him-with-the-ten-stings as well,
also from the fetterlook of the Tamer (Yama, king of Death)
from all sickness sent by the gods (in retribution for offences).

In this incantation, consumption is sought to be expelled from the patient's body through the dual effect of the incantation and of powerful plants, all combined into one medicinal potion for the patient. The herbs are propitiated and flattered and reminded of their healing power. This last point is equally intended for the patient and his relations that he is being treated with such effective medicine. The patient is not only given the herbal preparation to drink, but also an amulet made out of them is tied on his arm, whose 'tiger-like' strength is extolled. Finally, and in anticipation, the physician remarks that through the administration of this drug, he has already snatched away the patient from the disease.[66]

The foregoing two hymns, one from the *Rigveda* and the other from the *Atharvaveda*, give us an insight into the whole procedure about the use of different herbals for treating diseases during Vedic times.

There are several other hymns in the *Atharvaveda* which provide us information about the specific uses to which different herbals were put to against various diseases.

Classification of Medicinal Plants

A classification of the medicinal plants according to the type of diseases they were employed to cure, mentioned in the *Atharvaveda* is as follows :

1. Those that cured different diseases of the body (*kāyachikitsā*).
2. Those that cured diseases of the mind (*bhutavidyā*).
3. Those that helped in the procreation and protection of children (*kaumāra-vidyā*).

4. Those that were used against wounds (*śalyavidyā*).
5. Those that were used as antidotes against the bite of snakes, etc. (*vishavidyā*).
6. Those that were used for securing prosperity and prolongation of life (*rasāyana*).
7. Those that were used for virility and erotic success (*vajikarana*).
8. Miscellaneous.[67]

1. Plants for Diseases of the Body

For Leprosy. The plant used was *haridra* (*Circuma longa*), and the following verses were chanted along with.

> Night-born are thou, O herb, O dark, black, dusky one ;
> O colourer, do thou colour this leprous spot and what is pale.

> Of the bone-born leprous spot, and of the body born that is in the skin, of that made by the spoiler-by incantation have I made the whole mark disappear.[68]

> The Asura-woman first made this remedy for leprous spot, this effacer of the leprous spot ; it has made the leprous spot disappear, has made this skin uniform.[69]

For Fevers. The plant used is identified as *Costus specious* or *arabicus* (*kuśttha*) and the following verses were chanted.

> On an eagle-bearing mountain, born from the snowy one, for they go to it with riches, having heard of it, for they know the effacer of fever.

> The Aśvattha, the seat of the gods, in the third heaven from here ; there the gods won the Kuśttha, the sight of immortality.

> Born in the north from the snowy mountains, thou are conducted to people in the eastern quarter, there they have shared out the highest names of the Kuśttha.

> Head-diseases attack, evil of the eyes, of the body all that may

Kuśttha relieve, verily a divine virility.[70]

Thou are born upon the mountains, as the most potent of plants, come hither, O Kuśttha, destroyer of the Takman, to drive out from here the Takman ![71]

Thou are born of the gods, thou are Soma's good friend. Be thou propitious to my in-breathing and my out-breathing, and to the eyes of mine !

Superior O Kuśttha, is thy name ; 'superior' is the name of thy father. Do thou drive out all diseases ; and render the Takman devoid of strength !

Pain in the head, affliction in the eye, and ailment of the body, all that shall the Kuśttha heal—a divinely powerful (remedy) forsooth !

2. Plants for Diseases of the Mind

The plants that were used for the purpose included *sahadevi* (*Sidacordifolia* and *Rhombifolia*) and *apāmmārya* (*Achyranthes aspera*). The following verses were chanted.

The truly-conquering, the curse repelling, the overcoming, the reverted one—all the herbs have I called together saying—may they save us from this.[72]

In the following verses meant for the same purpose, the plant identified, among others, is *ajasringe* (*Odina pinnata*).

By thee do we expel the Apsrases, the Gandharvas : O goat-horned one, drive the demon ; make all disappear by thy smell.

Where are the *aśwatthas*, the *nyagrodhas*, great trees, with crests—thither go away, ye, Apsarases ; you have been recognized.

Higher hath come this mighty one of the herbs, of the plants ;

> let the goat-horned *arataki*, the sharp-horned, push out.[73]

In the *avakā*-eating Gandhārvas[74], *avakā* is *Blyxa octandra*, a grass-like marsh plant.

The plant *varana* mentioned in the following verses is *Crataiva roxburghu*.

> The *Varana*, this divine, forest tree, shall ward off the Yaksha, that has entered this man—that have the gods warded off.[75]

3. Plants for Procreation of Children

In the following verses, the plants used are not mentioned, but the purpose is clear :

> The plants of which heaven has been the father, earth the mother, ocean the root—let those herbs of the gods favour thee, in order to acquisition of a son.[76]

> Whoever makes this woman one having a dead child or a miscarriage, him O herb, do thou make disappear, lustful for her, slippery.[77]

4. Plants for Wounds

The plants identified in the following verse are : *plaksha* (*Ficus infectoria*), *aśwattha* (*Ficus religiosa*), *khadira* (*Acacia catechu*), *dhava* (*Anogeissus latifolia*), *nyagrodha* (*Ficus benegalensis*), *parna* (*Butea frondosa*) and *arundhati*, a climber.

> If by a staff, if by an arrow, or if by flame as sore is made, of that thou are relief ; relieve thou this man. Out of the excellent *plaksha* thou arisest, out of the *aśwattha*, the *khadira*, the *dhaval*, the excellent *nyagrodha*, the *parna*, do thou come to us, O *Arundhati*.[78]

A preparation of these plants was perhaps applied locally over the injured area.

In the following verse, the plant identified is *pippali* (*Piper longum*).

The berry, remedy for what is bruised, remedy for what is pierced—that did the gods prepare ; that is sufficient for life.[79]

5. Plants as Antidotes

In the following verse, the plant mentioned is *madhuka* (*Bassia latifolia*).

From the cross-lined (snake), from the black snake, from the adder (what is) gathered—that poison of the heron-jointed one hath plant made to disappear.[80]

6. Plants for Prosperity

In the following verses, the plants intended to bring in prosperity are identified as follows :

Indra put thee (*aparajita*) on his arm, in order to lay low the Asuras ; smite the dispute of (my) counter-disputants ; make them sapless, O herb.[81]

The plant *aparajita* is *Clitoria ternata.*

Indra consumed the *patha,* in order to lay low the Asuras.[82]

The plant *patha,* is *Clypba hernendifolia.*

The *parna,* soma's formidable power, hath come, given by Indra, governed by Varuna, may I, shining, greatly, wear it in order to lengthen life for a hundred autumns.[83]

The plant *parna* is *Butea frondosa.*

As thou, O *Aśwattha* didst break out the *khadira* within the great sea, so do thou break out all those whom I hate and who hate me.[84]

The plant *aśwattha* is *Ficus religiosa* and *khadira* is *Acacia catechu.*

Thou are the highest of herbs, *talisa*, of thee the trees are subjects: let him be our subject who assails us.[85]

The plant *talisa* is *Flacourtia cataphracta.*

Me with a portion of *simsapa*, together with Indra as ally, I make myself portioned; let the niggards run away.[86]

The plant *simsapa* is *Delbergia sisu.*

7. Plants for Virility

In the following verses, the plants intended to bring in virility are identified as follows :

About thee with an encompassing sugarcane have I gone, in order to absence of mutual hatred ; that thou mayest be one loving one, that thou mayest be one not going away from me.[87]

The plant mentioned is *madhuka* (*Bassia latifolia*) or *yasthimadhy* (*Glycyrrhiza glabra*).

I dig herb, of plants the strongest, with which one drives off her rival ; with which one wins completely her husband.[88]

The plant is *patha* or *vanaparni* (*Clypea hernandifolia*).

Of the horse, of the mule, of the he-goat and of the ram, also of the bull what vigors there are—them do thou put in him, O self-controller.[89]

The plant is *kapitthaka* (*Feronia elephantum*).

As the black snake spreads himself at pleasure, making wondrous forms, by the Asura's magic, so let this *arka* suddenly make thy member altogether correspondent, limb with limbs.[90]

Wherewith they invigorate one who is lean, wherewith they incite one who is ill-with, that, O Brahmanaspati, make thou his member

taut like a bow.[91]
(with amulet of *arka* wood).

The plant identified in the above two verses is *arka* (*Calotropis gigantea*)

A conciliator, a love-awakener, do thou, O brown, beauteous one : push together both you woman and me ; make our heart the same.[92]

The plant identified with this verse is *Andropogon aciculatus*.

8. Miscellaneous

O thou of great leaves blessed one, rain increased, rigorous ! as a mother to her sons, be thou gracious to the hair, O Sami.[93]

Fix thou the old ones, generate those unborn, make longer those born.

What hair of thine falls down, and what one is hewn off with its root, upon it I now pour with the all-healing plant.

Fix thou the root, stretch the end, make the middle stretch out, O herb, let the black hairs grow out of thy head like reeds.[94]

The plants identified are *Prosopis specigera* and *Mimosa suma*.

Soma

Soma is an extract of the soma plant[95] which is said to have been brought to earth by the eagle from the heavens.[96] The plant is described to 'dwell' in mountains and name of the Mujavat mountain is specifically mentioned in this context.[97]

The colour of the plant, as also of the juice extracted from it, is said to be sort of brown or brownish green.[98] Extraction of the juice from the plant was done by crushing the stalk with a stone[99] or in a mortar and pestel.[100] The juice was strained by letting it ooze through sheep's wool.[101] Thus filtered, it was mixed with water, milk and honey and offered to gods. It was also mixed with barley and with

ghee.[102] Soma juice from the plant was extracted at different times of the day for offering it to different gods.

Its reaction on the body, after taking it, is described as 'like roar of a bull'.[103] It acts swiftly.[104] It is exhilarating and invigorating. It stimulates speech also.[105] The worshippers, after taking it, exclaim, "We have drunk soma, we have become immortal, we have entered into light, we have known the gods".[106] After taking it, Indra slew all foes and no one could resist him in battle.[107]

The soma juice had medicinal powers also. It said to have healed the sick, made blind see and lame walk.[108] It bestowed long life[109] and increased fertility.[110] Soma is the lord of all plants.[111]

The soma plant has not yet been recognized botanically. Different conjectures have however been made by many scholars. It probably belongs to ephedra family.

Nuclei of Ayurveda in Vedic Medicine

In the above-stated description of treating different diseases through incantations and the use of different herbal products, some fundamental principles of approach of the priest-physicians is discernible. The foremost is the simultaneous, many-sided approach to the disease, viz., (1) to propitiate god, (2) to make the demon flee, (3) to use herbals as amulets, and (4) to make a medicine out of the herbals for internal administration. This clearly indicates that the clever priest-physicians of that era, utilized all the different approaches that had proved effective in their experience at one time or the other.

The second factor in the practice of Atharvavedic medicine is a lot of showmanship on the part of the physician. He prays, he chants, he shouts, threatens, even uses violent language, and makes fearful gestures. All this is to impress upon the people around, including the patient's kith and kins.

The third factor is the priest-physician's direct address to the patient himself. He convinces the patient that by his powerful charm the disease-producing demon is running away thereby preparing him psychologically to fight the disease.

The fourth factor is the use of variety of herbals in various forms, showing that the priest-physician had some idea of their action and efficacy.

The next step was only to discard the superstitious garb of the

magic verse and to administer the medicine.

It appears that during Atharvavedic times, there existed two types of healing arts and their adherents. The first was the one which predominantly depended upon incantations of magical verses to cure the disease. The second type did use the magical formulae but also used empirically or even rationally, different herbals, their products and concoctions. The use of amulets was profusely practised by both. The *Atharvaveda* mentions that "there were hundreds of medical practitioners and thousands of herbals, but that which could be achieved by a collective effect of them all, could be done singly by a charmed amulet".[112] Also the one who binds the amulet is described as the best of all doctors.

It also appears that while in the earlier times, priestly and magical practice was appreciated better, in the later times this was not so. The herbal doctor had developed by then confidence in the effectiveness of his drugs and it was this which gained ground gradually and culminated in the establishment of the Āyurvedic medicine of the classical period.

There are many verses in the *Atharvaveda* which are devoted exclusively to extol the virtues of different plants. They also indicate their specific uses in specific diseases and conditions.

Information gathered on the different aspects of medicine culled from Vedic literature shows that there is a mixture of supernatural and the natural, empirical and the rational. Diseases, in general, are considered to be caused by supernatural factors, yet it is also stated that a disease may originate because of one of the three possible factors : *abharaja* (*aqueous*), *vataja* (*wind*) and *sushamaja* (desiccating agents).[113] The desiccating factor is also called *pitta*.[114] Aqueous factor is termed *sleshma* in *Śatapatha Brāhmana.* The term *tridhatu*, referring possibly to the three bodily humours, *vata*, *pitta*, *kapha* or *sleshma*, occurs for the first time in the *Rigveda.* Different authors view these earliest references differently.

Writing about diseases in Āyurvedic medicine, S.N. Das Gupta said, "My own conclusion is that at least some Atharvavedic people had thought of a three-fold classification of all diseases, viz., those produced by wind, those by water and those by fire or those that are dry and burning. This corresponds to the later classification of all diseases as being due to the three *doșas*, *vayu* (wind), *kapha*, *sleshma*

(phlegm) and *pitta* (bile)."[115]

The later Vedic texts clearly accept that the human body (the microcosm) as also the universe (the macrocosm) is composed of the same five elements, viz., *prithvi* (earth), *apa* (water), *vayu* (air), *jyoti* (fire) and *ākāśa* (ether).[116] The *vayu* in the human body is categorised into five types according to location and function.

Thus we see that the different aspects of the medical science and art mentioned in the Vedic literature form a nucleus around which was later built the science of Āyurveda.

Mythical Origin of Ayurveda

The *Charaka samhitā* carries the following story about the origin of Āyurveda. The holy sages sat in a conclave on the slopes of the Himālayas. Among them were Angiras, Vasiṣta, Kāśyapa, Bhrigu, Ātreya, Nārada, Agastya, Mārkandeya, Bhārdavāja, Chyavana, Gārgya, Kātyāyana and many others : an assembly of about fifty of the most eminent sages. The topic of discussion was : "How to get rid of the prevailing diseases which were causing so much ill-health among human beings, and interfering in the performance of their duties."

Collectively, they came to the conclusion that Indra, the Lord of the Immortals, be approached as he knew Āyurveda, the science of longevity (*ayu* means life, and *vida*, to know, to attain). They knew that Indra had learnt Āyurveda from the twin physicians of the gods, the Aśvins, who had learnt it from Dakṣa Prajāpati ; the latter having learnt it in its entirety from Brāhma, the Creator.

Sage Bhāradvāja volunteered to go to Indra. The others agreed.

Bhāradvāja approached Lord Indra, bowed before him and in humility delivered the message of all the sages thus : "Diseases have arisen which are the terror of all human beings. Tell me, Oh Lord of the Immortals, the appropriate means of curing them."

Indra knew of the wide knowledge and understanding of sage Bhāradvāja, and hence could teach him the whole science of Āyurveda in brief.

After his return, Bhāradvāja passed on what he had learnt from Indra to the other sages, one among whom was Punarvasu Ātreya.

Ātreya taught Āyurveda to his six disciples, namely, Agniveśa, Bhela, Jātukarna; Parāśara, Hārita and Kṣparapāni. These disciples,

on the basis of their own understanding of the subject, composed treatises and read them before the experts, one among whom was Punarvasu Ātreya himself. The sages whole-heartedly approved these works and blessed the authors. The treatises became popular and proved helpful in mitigating human suffering.[117]

There is another version of the origin of the Āyurveda. This is given in the *Suśruta saṃhitā*. According to it when different types of diseases spread among human beings, and everyone felt helpless before this suffering and loss, Suśruta, along with some other sages approached King Divodāsa of Benares who was considered the incarnation of Lord Dhanvantari, and said : "Oh Lord, we are much grieved to see around us human beings suffering from bodily, mental, accidental and natural diseases. They lament and cry aloud like helpless beings without any friends or means. For curing these individuals, for the preservation of our own lives and for the good of all mankind, we have come here to be instructed in Āyurveda, and approach you as pupils."

Divodāsa assured Suśruta and other sages with these words : "You are welcome. You, my sons, are well educated and qualified to receive instruction in Āyurveda. The Āyurveda is a subsidiary branch of the *Atharvaveda*. Brāhma conceived it in one hundred thousand stanzas (*ślokas*) and a thousand chapters, before the creation of man. Afterwards in consideration of the short lives and the limited intellectual capacity of human beings, he divided it into eight chapters, viz., *śalya*, *śālākya*, *kayā-chikitsā*, *bhutavidyā*, *kaumāra-bhritya*, *agāda-tantra*, *rasāyana-tantra* and *vājikarana tantra*. Brāhma first expounded Āyurveda to Prajāpati, who taught it to the two Aśvins. From these twins, Indra studied the subject and from Indra, I obtained the knowledge. Now for the good of mankind, it is my duty to impart this knowledge to those who seek it in this world." [118]

Yet another version is found in *Kāśyapa saṃhitā*. It says : The Omniscient, Self-borne Brāhma, desirous of creating human beings, originated Āyurveda in the beginning for their protection, and later the elements and the universe. Afterwards, Brāhma expounded the holy, eternal, supporter of life, strengthening nectar Āyurveda to Aśvins ; they two expounded to Indra, Indra to the four sages, viz., Kāśyapa, Vasiṣta, Atri and Bhirgu, and the four sages to their sons and disciples for the maintenance and preservation of the four objec-

tives of life : dharma, wealth, desire and salvation.[119]

Such a mythical origin of Āyurveda, as described in different ancient medical texts, has similarity with the mythical origin of the healing arts of other contemporary or near-contemporary civilizations. Just as Brāhma revealed Āyurveda to the Indians, so did Thoth and Apollo reveal the Egyptian and Greek systems of medicines to their respective peoples.

The mythical stories about the origin of Āyurveda may have been circulated to make it acceptable to people. Just as good reviews or opinions expressed by eminent authorities make a book more acceptable to people now-a-days, it seems, in the same manner, in ancient times, manuscripts or knowledge said to have a divine origin or basis was more acceptable. This applies not only to ancient medical texts but to all books of knowledge in other fields as well. It was as true to India as to other civilised countries of the time.

Preceding Constituents of Ayurveda

These mythical stories apart, we can make an attempt to trace the origin of Āyurveda through bits of information available in medical and other manuscripts.

In the *Atharvaveda*, we find at least two systems of medical practice : one, the system predominantly of charms and magico-religious medicine ; two, the system of drugs used on an empirico-rational basis.

We have no medical or related text between the end of the Atharvavedic and the beginning of the Āyurvedic periods about the sixth century B.C. We, however, know that many of the Brāhmanas and Upaniṣads were composed during this interval, and these scriptures themselves throw some light on the medical practices that prevailed in this period. The *Gopatha-brāhmana*, the Brāhmana of the *Atharvaveda*, mentions among other Vedas, the *Sarpaveda*, *Piśachaveda*, *Asuraveda* ; it, however, does not mention Āyurveda. The *Chhāndogya Upaniṣad* which is later than the *Gopatha-brāhmana*, mentions among the subjects of study pursued in those days, the *Atharvaveda*, *Sarpavidyā*, *Pitriyavidyā*, and *Bhutavidyā*, but it does not mention Āyurveda. So it can be surmised that during the period of Brāhmanas and Upaniṣads, Āyurveda had not come into being as such. If that is so, then the concept and the applied science of

Āyurveda must have been evolved roughly between 800-600 B.C.

The *Atharvaveda* mainly consists of *bhutavidyā* and *sarpavidyā* (*agada*). In the Brāhmanas and the Upaniṣads, besides the above two, there are also *rasāyana* and *vajikarna*. The Āyurveda contains, besides the above four divisions, another four, namely *śalya*, *śālākya*, *kayāchikitsā* and *kaumāra-bhritya*. Not that the knowledge about the latter four divisions did not exist before, but the existing knowledge was systematized, and thus originated the eight divisioned (*aśtānga*) Āyurveda.

The question now arises as to what led to this systematization of knowledge? What were the conditions or compulsions that made people think of it ? How is it that a predominantly magico-religious system of medicine changed into a rational system of medicine with a broad-based theoretical background ?

One thing we know for certain. The whole atmosphere of this period was overwhelmingly philosophical. The change in the outlook of medicine from the magico-religious to the physical causation and theories, could very well be the result of the neo-philosophical concepts of the Nyāya-Vaiśeṣika and the Sāmkhya on which the theoretical structure of the Āyurveda is based.

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Charaka Samhita *(Charaka collection) is the name of the first document of Indian medicine which has come down to us. The facsimile below shows part of a copy.*

11. A Page from *Charaka samhita*.

The Susruta Samhita

12. A Page from *Susruta samhita*.



13. Buddha Treating a *Bhikshu*.

by scholars about this hypothesis. Firstly, there is no evidence to identify him with the author of the *samhitā* or with any work at all in the Buddhist text. Secondly, if he was the author of this *samhitā*, he would have mentioned the name of the king in his book in an appropriate manner, for being a royal physician he was dependent on the king. Thirdly, as Buddhist influence was predominant in Kanishka's court, there should have been some evidence of it in the *samhitā* also, which is not so.

By examining all available sources it seems that Charaka may have lived between the second century B.C. and second century A.D. While the above-stated hypotheses state their own point of view, the most accepted date for the redaction of the *Charaka samhitā* by Charaka is around AD 100.[1]

Charaka is one of the best known, and the most popular name in Āyurvedic medicine. During the seventh, eighth and ninth centuries when Arabic scholarship was at its height, Charaka was revered as an authority on medicine in the Islamic and Roman worlds. Between the eleventh and sixteenth centuries, Charaka's fame spread to West and Central Asia, and further to Europe. Indian tradition gave him semi-divine stature by calling him an incarnation of Śeṣa, the cosmic serpent who supports the universe. Bhāvamisra, around A.D. 1550, wrote about him : "Śeṣa, the king of serpents, who is versed in the Vedas and Āyurveda, which is a sub-veda of the *Atharvaveda*, took his birth in the world as a son of a sage, and went about as a peripatetic teacher".

During the ninth century, A.D., the *Charaka samhitā* was again edited and reconstructed by a Kashmiri pandit named Dridhabala, son of Kapilabala, a resident of Panchanādapūra, now known as Panjor, seven miles off Srinagar. The place is in the vicinity of the confluence of the five streams, Trigama, Vitasta (Jhelum), Sindhu, Ksirabhavani and Anachara. The present volume of *Charaka samhitā* is the handiwork of Dridhabala.

The contribution of Dridhabala to the present *Charaka samhitā* is mentioned in this text by Dridhabala himself. He states : "The redactor (Dridhabala) enlarges that which is concise and abbreviates what is very prolific and in this manner brings an ancient work up-to-date. Thus, this best of all treatises, which is replete with truth and wisdom, and which has been redacted by the extremely enlightened

Varanasi publisher.

The *Kāśyapa samhitā* gives details about the teething process in children, names of the teeth, the time they appear and the accompanying symptoms. It also mentions rickets and the use of garlic.

Lost Tantras and Samhitas

Some of the tantras and samhitās mentioned in different commentaries on Āyurvedic treatises are now lost. A list of such lost works is as follows.[4]

Tantras relating to Kayā-chikitsā : *Agniveśa samhitā, Bher samhitā, Jatukarna samhitā, Paraśar samhitā, Harita samhitā, Kśarpāni samhitā, Kharnad samhitā, Viswamitra samhitā, Arindra samhitā, Ātreya samhitā, Markandeya samhitā, Ashwin samhitā, Bhāradvāja samhitā, Bhanuputra samhitā.*

Tantras related to Śalya (Surgery) : *Aupdhānav tantra, Urbhar tantra, Brihat Suśruta tantra, Pushkalawat tantra, Vaitran tantra, Vridh-Bhoj-tantra, Bhoj tantra, Khitvirya tantra, Karvirya tantra, Gopurrakhit tantra, Bhaluki tantra, Kapibala tantra, Subhuti-Gotama tantra.*

Tantras relating to Śālākya (Surgery above the neck) : *Vidheh tantra, Nimi tantra, Kānkāyana tantra, Gargya tantra, Galva tantra, Sātyic tantra, Bhadra-Śonaka tantra, Śonaka tantra, Karal tantra, Chakshu tantra, Krishna-atreya tantra, Katyayana tantra.*

Tantra related to Bhutavidyā (Demonology) : *Atharva tantra.*

Tantras related to Kaumara bhrytya (Pediatrics) : *Vridha Kāśyapa samhitā, Sanaka samhitā, Latyayan samhitā, Ahlambayan samhitā, Ushna samhitā, Hrihspati samhitā.*

Tantras related to Rasāyana : *Pātanjali tantra, Vyadhi tantra, Vaśiśta tantra, Mandva tantra, Nāgārjuna tantra, Āgastya tantra, Brigu tantra, Kapinjala tantra, Kakśaput tantra, Ārogya manjari.*

Tantras related to Vājikarana : *Kuchumār tantra.*

The literature on Āyurvedic system of medicine entered a new era when the *samhitās* on medicine and surgery and *tantras* or *kalpas* on other branches of Āyurveda gave way to compendia of prescriptions for various diseases. The first compendium which we have with us now is the *Nava-nitaka.*

leaves and contains the story of how a charm against snake-bite was given by the Buddha to Ananda while he was staying in Jitavana, the garden of Anantapura. The fourth part consists of six leaves and has not been preserved properly. It appears to contain a collection of proverbial sayings similar to the second part. The fifth part consists of six leaves which are not in a good shape—like the fourth part—and appears to contain a collection of proverbial sayings to the second part. The sixth part consists of five leaves and contains another medical treatise which appears to be the first chapter of a larger unfinished work.

The author quotes from the *Charaka* and the *Suśruta samhitās*. From the *Bhela samhitā* fifteen formulae are taken and from the *Charaka samhitā* twenty-nine. Besides these forty-four formulae, the *Nava-nitaka* contains a considerable number of other formulae as well. Their authors are not indicated and now it is impossible to locate their correct authorship. These include six formulae which occur in the *Suśruta samhitā*. These formulae are quoted, not directly from the work of Suśruta, but intermediately through the *Bhela samhitā* ; the text of these in the *Nava-nitaka* is identical with that in *Bhela samhitā*. The *Nava-nitaka* quotes three formulae from *Bhela samhitā* which the latter derives from *Uttara-tantra* of *Suśruta samhitā*. The three other formulae are from the main text of the *Suśruta samhitā*. The remaining unnamed formulae are probably taken from the treatises of the four other pupils of Ātreya, which we know were in existence at the time of the *Uttara-tantra*, and so may be presumed to have existed when the *Nava-nitaka* was compiled.

Since these formulae are quoted without naming the authors, it may be presumed that these three *samhitās*, viz., the *Charaka samhitā*, the *Suśruta samhitā* and the *Bhela samhitā*, were all in existence sometime before the compilation of the *Nava-nitaka*. There are no formulae from that portion of the *Charaka samhitā* which is attributed to Dradhabala.[8] Among the names that the manuscript mentions are those of Kānkāyan, Nimi, Ushnus, Āgastya and Jivaka.

The title *Nava-nitaka*, meaning butter, is indicative of its nature; just as butter is extracted out of milk, so does this work contain the essential formulae extracted from other larger works. According to one scholar, the author of *Nava-nitaka* was Navanita.[9]

The *Nava-nitaka*, for the first time, gives details about the use

of garlic in various diseases such as consumption (*rajyayakshma*) and scrofulous glands in the neck. Tied with a thread it was also hung on the door ; this was supposed to check the spread of infectious diseases like smallpox. Garlic was recommended for use in winter and spring.

Vagbhata's Treatises

Vāgbhata, according to ancient Indian medical tradition, is one of the three medical authorities (*Vriddha Trayi* or Old Triad), the other two being Ātreya and Suśruta.

While the two medical treatises namely *Aśtanga Samgraha* and *Aśtānga Hridya samhitā* were said to have been composed by Vāgbhata, some twentieth-century scholars have opined that there were two Vāgbhatas, each being the author of one of the two above treatises. A passage in *Aśtānga Hridya* gives that impression, but closer examination reveals evidence to the contrary.

An advocate of one Vāgbhata argues the case as follows : (1) Language and style are similar and many verses from *Aśtanga Samgraha* (AS) are found without any alteration in *Aśtanga Hridya* (AH). (2) The apparent contradiction that the exposition and language are of a higher order and show greater maturity in AH is not altogether in favour of two separate authors ; AS was written first and AH later. By the time of writing AH, the author acquired greater knowledge and experience in the science of Āyurveda, as well as greater command on the language and had attained maturity in outlook and exposition. Hence the composition and style is of a higher order. (3) Name of the father of the two authors is also the same. (4) No differences of opinion are found in the two treatises. A few exceptions may be noted, but they can be easily explained. In AS, Vāgbhata compiled what he had learnt from old classics and from his teachers, but in AH, a work of his later age and intellectual maturity, he revised some of his earlier views. (5) In AH, the author clearly states that this work is like a heart or core of AS. (6) The author of AH quotes the statements of Charaka and Suśruta in his own language but verses from AS are incorporated *verbatim*. (7) The commentators of these two treatises also accept the view that both works were written by the same person.[10]

Subba Reddy states the present position about the above

controversy as follows : "While the evidence produced above states the author of the two treatises as a single Vāgbhata, yet the evidence being only circumstantial, this controversy cannot be deemed as closed. But this evidence is such that we can take it to prove the case of one Vāgbhata until and unless further evidence proves it to be false."

Since there is an overwhelming evidence in favour of one Vāgbhata as the writer of both the treatises, we will accept the theory of one Vāgbhata. Both the books describe Vāgbhata as the son of Simhagupta. He was born in Sindhu, on the banks of the River Indus. He seems to have studied under a Buddhist teacher named Avalokitashvara. In *Aśtānga Hridya*, the prayer at the beginning of each section seems to be addressed to the Buddha, but various commands regarding the worship of gods, cows, Brāhmins, elders, physicians, kings, guests, as well as the recommendations regarding the performance of propitiatory rites, however, show Vedic influence. It is believed that Vāgbhata, though a Vedic Brāhmin by birth, was influenced considerably by the teachings of the Buddha and later in life adopted Buddhism as his religion.

Though the time of Vāgbhata cannot be stated with any certainty, yet the consensus of opinion places him and his two treatises in the seventh century A.D. Tibetan, Chinese and Arabian sources also lend support to this view.

Astanga Samgraha

The *Aśtānga Samgraha* is still studied by scholars of indigenous medicine all over India, more so in the South. In style, the composition is an amalgam of prose and verse. It is predominantly based on the teachings of the *Charaka* and the *Suśruta samhitā* though it also gives its own views on different aspects on the science of healing. Divided into five sections viz., *sutra*, *nidāna*, *śarira*, *chikitsā*, *kalpa* and another *uttara sthāna*, it contains a total of 150 chapters. In the first section on Practice of Medicine, it describes the initiation of the students, longevity and the methods of attaining it, daily and seasonal observances, origin of diseases, properties of different food articles such as rice, meat, herbs, fruits, characteristics of poisoned food, treatment after having taken poisoned food, precautions to be observed by the kings, incompatibility in the foods, personal hygiene, drugs

and their sub-divisions ; collection, composition, taste, strength, qualities, and actions of medicinal substances ; emetic and astringent drugs ; *vata, pitta* and *kapha* and their derangement ; various diseases ; examination of the patient, principles of treatment ; snuffs, fumigants, gargles, treatment of eye diseases with soothing applications and eye drops ; venesection, extraction of foreign bodies ; caustics, cautery and the use of alkalies.

The second section, mainly on human anatomy, describes the changes in the structure of the foetus during pregnancy, management of difficult labour and diseases of pregnancy ; anatomy of the human body, vascular system, vital parts of the body ; nature of man; different types of men and their characteristics ; abnormal characters, prognosis based on shadows and messengers.

The third section describes the causes and pathology of various conditions such as fever, haemorrhage, asthma, phthisis, delirium tremens, piles, diarrhoea, retention of urine, diabetes, deep-seated abscesses, abdominal diseases, anaemia, leprosy, skin diseases, and diseases of the nervous system.

The fourth section is on purgation and vomiting.

The fifth and the last section describes management of children, diseases of the children, demonical seizures in children and their treatment, diseases caused by superhuman influences and their treatment ; treatment of insanity, epilepsy, various diseases of the eyes including blindness and inflammation, diseases of the ear, nose, mouth, head ; ulcers, wounds, fractures, fistulas, glandular enlargements, minor diseases, diseases of the organs of generation, treatment of poisoning ; snake, insect, spider and mouse bites, antidotes, rejuvenation and the use of aphrodisiacs.

The *Aśtānga Samgraha* as already stated, occasionally differs from the views expressed by Charaka and the Suśruta. With regard to the *tridoṣa* theory, it distinguishes the *dhātus*, the seven constituents of the body, from *vayu, pitta*, and *kapha* by calling the latter *doṣas* (polluting agents) and the former *duṣyas* (the constituents which are vitiated). It denies that *malas* of *dhātus* could be the cause of disease. According to it, disease is not *dhātuvaisamya*. In another place it says that the manifold universe is but a modification of *gunas*, so all diseases are but modifications of the three *doṣas*. In another place, it uses the simile of the three *gunas* with reference to three *doṣas*.

The commentaries on the *Aśtānga Samgraha* were written by Arunadatta about 1220 A.D. and by Hemādri a few decades later.

Astanga Hridya Samhita

Like the *Aśtānga Samgraha* it is divided into *sutra*, *nidāna*, *śarira*, *chikitsā*, *kalpa* and *uttara sthāna*, following the tradition of the Suśruta, and not of the Charaka. It contains 120 chapters and the author quotes Charaka, Suśruta, Bhela, Nimi, Kāśyapa, Dhavantari and other earlier authors and their works; the chief source, however, is the *Aśtānga Hridya.* It gives a complete but concise description of Āyurvedic medicine. Particular stress is laid on surgery. It does not mention the use of opium in the treatment of diseases and the feeling of the pulse as part of the process of diagnosis. Use of oxidized metals (*bhasmas*) too is not mentioned here.

The *sutra-sthāna* of *Aśtānga Haridya* is especially famous and popular. A later popular couplet says: "The best authorities in medicine are Mādhava for *nidāna* (diagnosis), Vāgbhata for *sutra-sthāna* (theoretical basis of general principles), Suśruta for *śarira* (structure of the body) and Charaka for *chikitsā* (treatment)."

The *Aśtānga Hridya* has all along been a very popular treatise. Many commentaries on it have been written from time to time by as many as thirty-five important Āyurvedic physicians, each one interpreting it to the best of his knowledge and experience. The following commentaries are known to be more important among them: (1) Arundatta's *Sarvānga Sundari* written in A.D. 1220; (2) Hemādri's *Āyurveda Rasāyana* written somewhere between A.D. 1271-1309; (3) Asadhara's *Aśtānga-hridya Uddyot*; (4) Chandernandana's *Padārthachandrikā* (it mentions the names of Hemādri and Dalhana; hence may belong to about tenth century A.D.); (5) Damodara's *Sanketa manjari*; (6) Ramanatha's *Aśtānga Hridya-tika*; (7) *Bāla prabodhikā*; (8) *Hridyabodhikā*; (9) *Pāthya*; (10) Harikrishna's *Vāgbhtāratha Kaumudi*; (11) Jasodanandan Sarkar's *Pradipa*.

The *Aśtānga Hridya* was translated from Sanskrit into Persian in 1473 A.D. by Hakim Ali Mohammed Bin Ali Islmaili Asavali Aseeli, and dedicated to Mahmood Shah I, the ruler of Gujārat.

The *Aśtānga Samgraha* and the *Aśtānga Hridya*, particularly the latter, indicate an advancement in knowledge over the two *samhitās*

of *Charaka* and *Suśruta*. This is particularly noticeable in the new drugs and some of the new surgical procedures that have been introduced. These treatises of Vāgbhata were extensively used and, in fact, they overshadowed the earlier *samhitās* to such an extent that some portions of them were lost irretrievably. Later writers like Śarangadhara, Chakrapānidatta and Bhāvamiśra quoted these treatises repeatedly in their works.

About their historical value, Subba Reddy states : "The two treatises are worthy of study by medical historians, particularly those familiar with the medical works of Greek, Roman and Byzantian writers, whose compilations helped and influenced the early Arab writers. How else is one to explain the presence of some new drugs and new procedures of treatment, particularly in surgery ? It cannot be said that surgery evolved in India, by a process of trial and error, between the age of Suśruta and the age of Vāgbhata, in the barren interregnum, when Buddhist philosophy discouraged the use of the lancet, and the frequent invasions and depredations from the north-west and the internal feuds were not conducive to the development of surgical skills of peace time."[11]

Chikitsa-Kalika

The *Chikitsā-Kalikā*, a treatise dealing with prescriptions of various diseases, was composed by one Tiśtācharya, probably a resident of Kashmir. Tiśtacharya was either a contemporary of Vāgbhata or came a little later than him. The *Chikitsā-Kalikā* is written in a beautiful language. It was later commented upon by Chandrat, son of Tiśtācharya ; this commentary was called *Yogaratnasumuchchaya.*

By this time treatises dealing with prescriptions were becoming more and more popular, and people were paying lesser attention to the ancient *samhitās* of *Charaka* and *Suśruta.*

Madhava-Nidana

The time of Mādhavakara, the writer of *Mādhavanidana*, is not known with certainty. Vāgbhata mentions Charaka and Suśruta but not Mādhava. Mādhava, on the other hand, does not mention anything about Dridhabala's edition of *Charaka samhitā*. So Mādhava may have existed after Vāgbhata but before Dridhabala. Furthermore, Vrinda knew about Mādhava. These indirect sources indicate that

Mādhava may have existed in the ninth or tenth century A.D.

The *Rug-viniśchaya,* Mādhavakara's famous treatise is written in a simple language and style. It is easily understandable by ordinary physicians and became very popular and came to be known as *Mādhavanidāna* or simply *Nidāna,* It specializes in the diagnosis of the diseases. The order in which it describes the causes, symptoms and complications of the important diseases, sets an example for the future authors such as Vrinda, Vangasena and Chakrapānidatta. Its description of diseases shows a significant advancement compared with that of *Charaka* and *Suśruta samhitā.* A special chapter is devoted to smallpox, which previously was described only marginally. It, however, literally quotes, many a time, the *Charaka* and the *Suśruta,* which shows the borrowing it made from these sources.

At a later date, numerous commentaries were written on Mādhava's *Nidāna,* which indicate the fame and popularity of this work. The most famous of these commentaries was *Madhukosh* by Vijayarakśita and his pupil Srikanthadatta in the fourteenth century. The other commentary *Antak-darpan* by Vachāspati also belongs to the later half of the fourteenth century.

Kalyana Karaka

During the ninth century A.D., a treatise called the *Kālyana Kārāka* was composed or redacted by Ugradityāacharya, a Jain scholar of Deccan. This was done during the reign of Nripatuga (815-877). It was written after Vāgbhata and describes the use of mercury and many other compounds for treatment.

In the preparation of this treatise, the author mentions works of many older authorities such as Pujyapada. Samantabhadra, Paatrakesariswamy, Siddhasenaacharya, Dasarata Muni, Meghnathācharya and Simhanātha Muni.

The author suggests other remedies and dietetics instead of wine and meat. According to it, medicine originated when the first Tirthankāra Rishabanāth, the fountain-head of all knowledge, was approached by Bharata and other Jain sages, with a request to impart to them the knowledge of the science of life. He instructed them in the science of health and disease. On the basis of his lessons, these sages wrote different treatises on medicine. According to the Jaina tradition, all revealed knowledge was divided into twelve divisions and in

the twelfth division there were fourteen sub-sections and one of these fourteen sub-sections was *Prāna Vaya,* a word which means Science of Life.[12]

The *Kālyana Kārāka* describes the structure and functions of the body. According to it, there are in the body 300 bones, 300 joints, 900 tendons, 700 vessels and 500 muscles. Adjacent to the umblicus, there are twenty-four *dhamanis,* sixteen *kendaras* and 6 *kurchas* (?). There are seven layers of skins, eight passages or tubes, liver, spleen, stomach and a row of sixteen segments of large intestine. There are 107 *marmas* (vital centres), nine external openings, and eighty lakh hair follicles. There are three *doṣas,* which are also called *stunas* (pillar or beam or support). There are thirty-two teeth, twenty nails, and an *anjali* (a measure equivalent to the amount added to fill the hollow made by joining two hands) of marrow, seminal fluid and brain ; *vasa* (fat) is of the measure of three *anjalis, pitta* and *kapha* are of the measure of eight *prasritis* (8 *tolas*) ; and blood is of the measure of *adhāka* (250 *tolas*). Urine and stool are of the measure of one *prastha* (64 tolas) and half *adhāka* respectively.

The *Kālyana Kārāka* sets out rules and regulations about diet. According to it, the substances which are dry, alkaline, astringent, pungent and bitter are wholesome in the spring season. Foods and drinks, having these qualities are good. *Gur,* sugarcane juice and well-water are wholesome. In the rainy season, substances which are very bitter, light, pungent and astringent are wholesome ; milk and sugarcane, etc., are good and water which is boiled and cooled should be used. In the winter, food with plenty of milk, *ghee* and sugar, and that with bitter and astringent tastes should be taken. All kinds of water are suitable for human beings in this season. In the winter season, pungent, bitter and cold substances are unwholesome. Substances which are astringent as well as sweet and are prepared with *ghee* and oils are good. Water from all sources is good. In the autumn, food should be acid, astringent, bitter and salty, and hot milk should be taken. Water of tanks is unwholesome in this season.

During meals, materials which are oily and sweet are to be taken first ; salt and acid substances are to be taken in the middle ; substances of other *rasas* are to be taken in the end. After knowing what agrees with him and sitting comfortably, one should eat food which is hot and suitable to the season, attentively and quickly ; liquids

should be taken in the order of their fluidity, the viscous first and thin liquid last.

After eating food containing pulses, one should drink *kanjika.* If the food consists of materials like rice, etc., butter-milk should be taken. After eating oily substances, like *ghee* etc., one should drink hot water, and after eating starchy substances, one should drink cold water. According to it, drinking of water just before meals causes leanness of the body ; drinking water in the middle of the meal causes moderate health ; drinking water at the end of the meal causes fattiness of the body. "Knowing this, a person should always take his food materials along with some fluid substances ; otherwise dry food may not be digested easily and may cause pain".[13, 14]

Treatises Showing Influence of Tantric Cult

With the decline of Buddhism in India, there appeared a popular philosophical and religious movement called Tantra. Though it originated earlier, it flourished between the eighth and the fourteenth centuries A.D. Through it, the devotees sought deliverance with the help of *mantra, samādhi* and other such practices.

With tantrism developed the art and science of the use of metallic compounds, particularly of mercury and sulphur. This was with the intention of making the human body undecayable and ever young. The adepts in tantrism were said to possess miraculous powers and were called *siddhas.* There were many such *siddhaṣ*, but the one most renowned among them was Nāgārjuna.

Rasaratnakara

Nāgārjuna is said to be the author of *Rasaratnākara.* From the study of the text, it appears, it is a work composed after the time of Vāgbhata, who lived in the eighth century.[15] Alberuni refers to a Nāgārjuna, resident of the fort Daibhak, near Somnath, who composed a book on *rasāyana.* According to him, Nāgārjuna lived about a hundred years before his time.[16] It appears that Nāgārjuna, author of *Rasaratnākara,* lived some time between the eighth and ninth century A.D.

Nāgārjuna composed some other works which include *Kakśaputa-tantra* and *Arogya-manjari.*

Rasaratnākara deals with the preparation and use of metallic

compounds, particularly of mercury. It describes certain recipes in which vegetable or animal products are used to transform other metals into compounds which look like gold and could be passed off as gold. These compounds, particularly of mercury, were prepared and used in order to make the body undecayable and strong.

Nāgarjuna was quoted as an authority on *rasāyana* by later authors as Vrinda and Chakrapāni.

Nibandha Samgraha

Dalhana who wrote a commentary on the *Suśruta samhitā*, called *Nibandha Samgraha* probably lived in the tenth century A.D. He belonged to Mathurā. He is said to be the son of Bharatpāla. His commentary is still considered an important work. Chakrapānidatta refutes some of the theories that were put forward by Dalhana, but he does not mention the name of Dalhana.

Siddha Yoga

Vrinda composed a treatise called *Siddha Yoga* probably around 1000 A.D. This treatise is a medico-chemical work which incorporates some of the material from the works of Charaka, Suśruta, Vāgbhata, Mādhavakara and Nāgārjuna. This became very popular. A commentary called *Kusumavali* was written on it by Sri Kanthadatta around fourteenth century A.D. The commentator states that the *Siddha Yoga* makes particular mention of the diseases prevalent in Western India. Maybe Vrinda belonged to that region.

The *Siddha Yoga* is in the nature of a *samgraha* and follows the method of Vāgbhata and others and gives a survey of the classical methods of treatment. This is the first large treatise dealing with prescriptions. In it, Vrinda prescribes mercury for internal use. A preparation known as *parpati tāmaram* is described ; sulphur, copper, and pyrites are to be pounded together with mercury and roasted in a closed crucible and the product thus obtained was meant to be administered with honey. Sulphide of mercury constitutes the main ingredient of another preparation called *rasāmrita churanam* ; for this, one part of sulphur and half its weight of mercury are to be rubbed together ; this is to be administered with honey and clarified butter. The *Siddha Yoga* also mentions mercury as a constituent of a medicine, to be used externally, for killing lice. It describes copper

compounds in the preparation of a collyrium.

The *Siddha Yoga* of Vrinda was considered to be a very important treatise. It was among the books translated into Arabic.

There is some controversy with regard to the identity of Vrinda. Some authorities consider him a different person from Mādhava and later than Mādhava. But Hoernle argues that Mādhava and Vrinda are one and the same person. He thinks that Vrinda first wrote the *Nidāna* and then *Siddha Yoga*, also called *Vrinda-Mādhava* or Therapeutics, as a supplement to it. Das Gupta agrees with Hoernle about Vrinda and Mādhava being the same person.

Chikitsa-sara-samgraha of Chakrapanidatta

Around 1066 A.D., flourished an Āyurvedic physician, Chakrapānidatta, who composed a large number of treatises on different aspects of Āyurveda. Chakrapānidatta has given an account of himself in his book *Chikitsa-sāra-samgraha* : "The author of this work is Chakrapāni who belongs to the family of Lodhravati, and who is youngest brother of Banu and the son of Narayana, the Superintendent of the Kitchen of Nayapala the King of Gour". His teacher was Naradatta.

The *Chikitsā-sār-samgraha* is composed on the lines of Vrinda's *Siddha Yoga*, but in comparison with the latter, it contains more and newer prescriptions ; it also makes use of more metals in its prescriptions. A commentary called *Ratnaprabhā* was written on it by Nischal in the twelfth or thirteenth century ; another commentary entitled *Tatvachandrikā* was composed by Shivdas Sen in the fifteenth or sixteenth century.

The *Dravya-gun-samgraha* is another treatise which gives details about the exact quantities of the medicines used in making various prescriptions.

A commentary on *Charaka-samhitā*, called *Āyurveda-dipikā* or *Charaka-tatparya*, and on *Suśruta samhitā* called *Banumati* was composed by Chakrapāni ; his other works are *Muktavali* and *Sabda Chandrikā*. *Muktavali* gives names and properties of Āyurvedic drugs.

Chakrapāni was versatile. He wrote commentaries on non-medical topics also such as *Kadambari*, *Nyāya sūtra*, etc.

Chikitsa-sara-samgraha of Vangasena

Vangasena, son of Godadhar of Kantikivas of Bengal who lived around A.D. 1200, also composed a treatise called *Chikitsā-sāra-samgraha.* This is akin to Vrinda's *Siddha Yoga* and Chakrapāni's *Chikitsā-sāra-samgraha.* It describes the use of mica, iron, mercury, sulphur and copper. It gives more prescriptions for the use of these metals than does Chakrapāni. It contains additional information which makes it a complete treatise on Āyurveda. It gives us sufficient information about the practice of Āyurvedic medicine in India around 1200 A.D.

Guna-samgraha

Another Ayurvedic treatise of the twelfth century A.D. is *Guna-samgraha* by Sothal of Gujarāt. Sothal seems to be a contemporary of Vangasena, but being a resident of Gujarāt, he has described the pharmacopoeia of that place in greater detail, which description is not available in other treatises.

Uptill the seventh and eighth centuries A.D., Āyurvedic drugs were derived from vegetable products. Metals such as iron, silver, tin and lead were very sparingly used for medical purposes. Charaka in his instructions for the preparation of *Lauhadi rasāyana* describes in detail a method of preparing iron for the purpose of his *rasāyana.* He mentions that the same treatment is to be adopted for the preparation of gold and silver. Suśruta in his classification of medicines, mentions a *trapu* or tin group which consists of tin, lead, copper, silver and iron. It is doubtful whether Charaka ever prescribed mercury for medical purposes. Suśruta mentions mercury twice, but only as unguents for external use. Use of metallic compounds begins with Nāgārjuna. Vrinda mentions mercurial preparations both for external and internal use. The use of metallic compounds for medical purposes progressively increased.

The works of Chakrapānidatta and Vangasena mark a distinct advance in this direction. Chakrapānidatta in his treatises describes a process of roasting iron. He mentions *mandura* or the rust of iron and prescribes it in combination with other drugs. He describes a method of preparing *kajjali* (black sulphide of mercury) and *tamar-yoga* (sulphide of copper). He also mentions *roupyamal* or calyx of silver in connection with a preparation called *yogaraja.* Vangasena

deals exhaustively with three kinds of iron, six kinds of steel, purification of steel, the 'killing' of iron by melting, powdering, etc. He also speaks of properly purified quick silver, of *rasaparpata*, the preparation of quick-silver and of other metallic and mercurial mixtures, but does not enter into the particulars of the methods of working on mercury.

Treatises that Mention of Pulse-Examination

Saiangadhara Samhita

The ancient classical Āyurvedic treatises do not contain any clear reference about examination of the pulse (*nādī-priksha*) as a method of diagnosing diseases.

The earliest Indian medical treatise to mention *nādi-prikshā* is said to belong to twelfth century A.D. *Śārangadhara samhitā* composed by Śārangadhara sometime between the thirteenth and fifteenth centuries is the first important Āyurvedic treatise to mention it. It examines the relation between the pulse-beat of a patient and the diagnosis of his disease. This treatise is also important for several other reasons.

The published manuscript of this treatise mentions Śārangadhara as the son of Damodar. But the manuscript itself does not reveal the name of the author. Another treatise called *Śārangadhara padhati* mentions the author's ancestral background : "In the territory of Shakambari was a reigning king Hamir. He had in his court one Raghavdev who had three sons named Gopal, Damodar and Devdas. Damodar again had three sons named Śārangadhara, Laxmidhar and Krishan." Śārangadhara was the author of *Śārangadhara-samhitā*. The date of *Śārangadhara samhitā* is a matter of controversy. According to Grierson, it is to be placed about 1500 A.D. on internal evidence. Jolly, on the evidence of a commentary on it by Vopadeva who flourished around the thirteenth century, opines that it was written in the thirteenth century. It may be remembered that Śārangadhara who is also the author of *Śārangadhara padhati* dates his work to *Samvat* 1420 or 1363 A.D.

This work initiates a new tradition in Indian medical literature. Charaka and Bhela followed the tradition of *Aśtānga Āyurveda* and their *samhitās* are divided into eight *sthānas*. But Vāgbhata follows

the precedent set by *Suśruta samhitā.* His works are divided into six *sthānas*, viz., *sūtra*, *nidāna*, *śarira*, *chikitsa*, *kalpa*, and *uttra*. With *Śārangadhara samhitā*, we have a break with this tradition. It is not divided into *sthanas* but into three *khandas* (sections) viz., *purva*, *madhya* and *uttara khandas*, and each *khanda* is again divided into chapters.

It contains a detailed account of calcination or preparation of different metals, such as gold, silver, iron, mercury, copper, tin and lead for internal use, with instructions for their administration. Opium and pellitory roots are mentioned in this work.

Śārangadhara samhitā is not a Tantric treatise though the author devotes the *madhya khanda* to a detailed description of metals and their purification, mercury and the methods of oxidizing mercury. It follows the orthodox system of therapeutics of the classical authorities but admits into the Indian pharmacopoeia important drugs like mercury and opium, and utilises them in therapy.

It marks certain important advances in the physiology of respiration, medical diagnosis and therapeutics. Neither Charaka nor Suśruta nor Vāgbhata reveal any knowledge about the lungs and their role in respiration. Śārangadhara makes two statements which are of importance with regard to the then extact knowledge of respiration. In the first place, he mentions the lungs by name, *puppusa*, and says that *udana vāyu*, one of the five *vāyus*, dwells in the lungs.[17] This is the first definite statement in Indian medicine connecting the lungs with the *vāyus* and thus with respiration. The second observation is equally interesting : "The *prāna vāyu* after coursing through the interior of the lotus-like heart, goes out through the throat to drink of the outside air, enters the body again to nourish the whole body and to keep up the digestive fire."[18] Though couched in poetic language, it is a remarkable statement about the function of respiration. No such statement is to be found in the whole of Indian medical literature.

Śārangadhara samhitā was translated into Hindi, Gujarāti, Bengali and Marathi ; this is indicative of its popularity. Two commentaries on *Śārangadhara samhitā* were written ; the earlier one by Adhamalla called *Dipikā* and the second by Kashiram called *Gurārthā dipikā* in the sixteenth century.

Treatises that Mention about Syphilis

Brihad Yoga Triangani

This was composed by Trimal Bhat, a Tailang Brāhmin. It mentions syphilis as *upadansha* but does not call it *phiranga roga*. As the author mentions *Śārangadhara samhitā* but does not mention *phiranga roga*, hence he can be considered to have lived between the time of Śārangadhara and Bhāvamiśra.

Todarananda Ayurveda

Akbar the Great attracted to his court scholars, musicians, physicians and scientists from great centres of Islamic learning in Persia like Ispahan, Shiraz and the original home of the Mongols like Samarkand and Bokhārā, as well as from the Mohammedan kingdoms of the Deccan in the South. There were also Hindu physicians and Āyurvedic doctors who received encouragement and patronage from the emperor, royal consorts and courtiers.

Todarananda Āyurveda saukeya, an Ayurvedic treatise named after Todarmal was either compiled by Todarmal himself with the help of Āyurvedic physicians, or was dedicated to him by some one whom he patronized.[19] Todarmal was an able statesman and army commander of Akbar, and had risen to very high office in Akbar's reign because of his meritorious services to the empire.

Bhavaprakasa

To the middle of the sixteenth century belongs Bhāva Miśra whose *Bhāvaprakaśa* is an important medical treatise. Bhāvamiśra was the last of the great men of Indian medicine. He was the son of Latakamiśra and lived at Varanasi in the year 1550 A.D. He was considered a jewel among physicians and one of the best scholars of his time. He is said to have taught and trained at least 400 students in medicine.

Bhāvaprakaśa is a voluminous treatise in which the author describes the best of the available material of the previous authors and sets forth his own views and experience. It is also divided into three *khandas* (sections) ; *purva*, *madhya* and *uttara*. In it the author systematically deals with the origin of Indian medicine, cosmology, human anatomy, embryology, physiology, medicine, diseases of

children, surgery, materia-medica, therapeutics, dietetics, rejuvenants and elixirs to prolong life. His clear style and excellent arrangement of subject matter has thrown a flood of light on many obscure and disputed views of ancient writers. He describes *nādi-prikashā* (examination of the pulse), and includes mercury and opium in the materia-medica.

By the time of Bhāvamiśra, foreigners from the European countries, particularly the Portuguese, had started pouring into India to enrich themselves by commercial pursuits. Many of them, however, were suffering from syphilis and so passed on the disease to the Indian people. Indian physicians were quite unfamiliar with this scourge as all their classical medical treatises were silent on this subject, even though they did describe other diseases of venereal origin. A new name was needed for this malady and as this disease was brought in the country by the Portuguese, it was called *phiranga roga*. Bhāvamiśra describes the three stages of this disease, first external (*bahya*), second internal (*abhayntra*) and the third both external and internal (*bahirantra*). The disease in the first stage is described as curable, in the second when joints become involved it is curable with difficulty, while in the third stage it is pronounced incurable. The patient suffering from the disease becomes lean and weak, his nose sinks, appetite lessens and his bones become dry and crooked. Mercury in the form of calomel, catechu, *Spilanthes oleracea* and honey in certain proportions are the recommended medicines. Certain other recipes are also mentioned.

Bhāvamiśra's *Bhāvaprakaśa* is still popular and is consulted by Āyurvedic physicians in India. He composed another small pharmacological work called *Gunaratnamālā*. It mentions China root, called *tob-chini* in the vernacular, as a remedy of *phiranga roga*. He was the first to make mention of certain drugs of foreign countries as *badhkshani naspasi*, *khorasani* and *arasika vacha* (*Acorus calamus*), *sulemani kharjura* (date fruit of Suleman) and opium.

Surgery is mentioned only in brief. A copy of *Bhāvaprakasā* dated 1558 is available in Tubingen.

Siva Tattva Ratnakara

At the beginning of the eighteenth century (1709), an encyclopaedic work entitled *Śiva tattva ratnākara* was composed by Keladi

Basava Raja. It consists of nine parts (*kallolas*), each *kallola* being divided into 108 *tarangas* or sections. It is written in Sanskrit verse.

The section on Āyurveda deals with the origin of Ayurveda. Its eight component parts (*aśtānga*), four kinds of treatment, qualities of a physician, the *doṣas* in the body, the time taken for digesting various kinds of foods, six kinds of tastes (*sadrasas*), their nature and effects, diagnosis, parts of the body and the things to be examined have been elaborately discussed. Further it deals with various kinds of pulse-beats, how pulse works in different diseases, pulse-beats in various living beings ; windiness (*vātaprakopa*) and its causes; biliousness (*pittodreka*) and its causes ; kinds of fevers and their effects ; things which reduce *vāta*, *pitta* and *kapha*. On the subject of treatment and drugs, the book fully explores the treatment and drugs which produce various results in the body ; seasons suitable for various kinds of medicines ; weights, measures and doses ; the qualities of food-stuffs and herbs and the preparations of medicines and how to test whether the preparations are satisfactory or not, and also doses and the duration of potency of the various classes of medicines. This includes mercury (*rasa*) and treatment by mercurial preparations; mica, pyrites (*maksika*), cowrie (*varati*), blue vitriol, lapis-lazuli, realgar, red chalk (*gairika*), yellow orpiment, red lead, arsenic, antimony and mercury ; their place of origin, nature, qualities, colour, uses, etc. Mercury (*rasa*), its purification, uses and effects when combined with other things ; various methods for conversion of base metals into silver and gold ; chemical laboratory and the proper arrangement of articles in it are part of the contents of the remarkable book. There is an interesting chapter on serpents. It discusses serpents, their varieties and nature, longevity and changes at different stages ; how to determine the kind of serpent which has bitten one ; when will man live even though bitten, and in which parts of the body ; poisonous bites by rats and spiders, and treatment by drugs.[20, 21]

Yogaratnakara

It was one of the most popular treatises with the Āyurvedic physicians. It contains the quitessence of larger books. It was composed around 1746 A.D. This is the first medical treatise which mentions tobacco and the use of *hukka*. Tobacco leaves were kept folded under the aching tooth for relief from pain. This treatise

mentions some new medicines and newer uses of the old medicines.

Other Ayurvedic Treatises

Between 1300-1800 A.D., a large number of medical treatises were written, many of which are not available now. Some of the authors, along with the titles of their treatises, chronologically, are as follows :

Author	*Treatise*
Narayan Bhatt	*Kanthaprākaś, Vaidchintāmani*
Vachāspati	*Antakdarpan*, commentary on *Nidāna*
Aśādhar	Commentary on *Aśtānga Haridya*
Hemādri	*Āyurveda Rasāyana*, commentary on *Aśtānga Haridya*
Kāśināth Dwivedi	*Raskalpalatā, Chiktsākramvali, Ajirnamanjari, Gunārthadipikā* commentary on *Śārangadhara samhitā*
Gangadhar Suri	*Vedāsara, samgraha*
Govindācharya	*Rasāsara, Sannipātamanjari*
Narayandas	*Cikitsā-paribhaṣā*
Madhavacharaya (Second)	*Sarvadarśana Samgraha, Rasaśwara*
Rudhradhar Bhatt	*Sannipāta-kalikā-krit, Gunantadipikā* commentary on *Śārangadhara samhitā*
Viśwanath Sen	*Sārasamgraha* commentary on Chakrapānidatta's *Sarva-sārasamgraha*
Ramraja or Ramroy	*Rasaratnaprādip, Rasadipikā, Nādi-prikshā*
Śivdasa Sen	*Charaka-tattva-pradipikā, Tattvabodh* commentary on *Aśtanga Haridya*; *Tattva-chandrika* commentary on *Chakradatta*, commentary on *Dravyaguna-samgraha and on Charaka samhita*
Vanśidhar	*Vaid-rahāsya-padati*
Narayan Sekhar Jain	*Yogaratnākara*
Bharat Malik	*Ratnākamaudi, Sar-kamaudi*
Vidyāpati	*Chikitsānjan*
Mādhava Upadhaya	*Āyurveda prakaś-adhi*

Author	*Treatise*
Anand Verma	*Sar-kamaudi*
Raj Vallabh	*Ratnamala, Raj Vallabh, Dravyaguna*
Gangādhar	*Jalpa-kalpa-taru*, a commentary on Charaka ; *Yogaratnawali, Agneya Āyurveda-bhasya*
Dhanpati	*Divya-rasendra-sara*
Narāyan Das	*Prayogāmrita*

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3

Indian Medicine in Non-Medical Texts

References about the practice of Āyurvedic medicine are found in many non-medical texts. The epics and other mythological stories are full of such references.

Epics

In the *Rāmāyana*, Laxman is injured in the battle. Vaid Sushain examines him and declares him alive on the basis of the following observations : "There is no change in his face ; neither it is darkened nor is there any loss of shine. His whole body is cheerful, his palms are red, his eyes are clear and transparent. The dead don't have such features."

Hanumān is sent to fetch a herb from the Himālayas. He brings back a hillock covered with different types of herbs as he could not recognize the one that was specifically needed. Vaid Sushain selects the particular herb, and after crushing it, lets Laxman smell it. Laxman gains consciousness, his pain disappears and the wound heals almost instantaneously.

In an earlier reference in the Ramāyāna, King Daśratha dies suddenly and till the return of his son Bharāta, his body is preserved in oil.

The *Māhabhārata* mentions Áyurveda with its eight divisions (*aśtānga*). In the cool shades of the forest called Chatrath, the sages discussed among other things, different aspects of Āyurvedic medicine. Chatrath is also mentioned by Charaka in his *samhitā* ; here the sage

and his disciples met and discussed topics of medical interest. It is believed that modern Chitral, near Dehradun, is Chatrath of those days.

There are instances of the treatment of snake-bite in the *Māhābhārata*. Once sage Kāśyapa was going to see king Parikshit. On the way Takśak addressed him and asked why he was in a hurry. The sage told him that king Parikshit was bitten by Takśak snake and he was going there to cure the king. Takśak revealed his identity and challenged him to revive a tree which he would bite. After Takśak had bitten the tree, the sage collected the cinders and with the help of powerful spells brought the tree back to life.

In the *Māhābhārata* we notice a general belief that the effect of snake venom is countered by snake poison and other natural elements. This is symbolically illustrated by the imagery of Lord Śiva. As the legend goes, the ocean churned by the Gods and Asuras, yielded an enormous quantity of poison which could destroy all living beings on the earth. Lord Śiva drank all the poison (*halahal*) and saved the world. To provide an antidote to this poison, the snakes coiled around his neck. When the poison started affecting his head, River Gangā meandered into his hair to keep his head cool. When the complexion of his forehead darkened due to the effect of poison, the crescent moon was provided to mask the discoloration.

In the *Māhābharata* again King Dūryodhan poisoned Bhim, one of the Pandava brothers. Being unconscious by its effect, he fell into a river. There the snakes bit him, drawing out the poison. He regained consciousness soon. He killed the snakes and came out of the river hale and hearty.

Mention is made of cases infusing life into the dead (*sanjivani*) in the *Māhābharata*. During the battle between the Gods and the Asuras, the two sides chose their family priests (*purohitas*), Brihaspati and Śukrācharya respectively, to heal the injured and the dead. Śukrācharya was well-versed in *sanjivani*. As such, the moment the Gods killed an Asura, Śukrācharya would bring him back to life. Brihaspati did not know this fine art. He sent his son Kācha *in cognito* to learn this from Śukrācharya. When his identity was known, the Asuras killed Kācha, but Śukrācharya revived him in consideration of his zest for learning and the risk he undertook in order to learn it. This happened twice. At last, after five years of learning and

having learnt the science of *sanjivāni* completely, he got ready to leave. But then Śukrācharya's daughter, Devayāni, who had fallen in love with him, insisted on him to marry her and stay on. When Kācha told her of his inability to do so, jilted Devayāni cursed him saying that the knowledge he had acquired will be of no avail. This, however, did not come true as she had cursed him for the sake of selfish love.

Panini's Astadhyayi

Pānini in his *Vyākaran* (Grammar), composed around 500 B.C., gives an account of the theory and practice of medicine at that time. According to him, charakas were a class of healers who travelled from place to place. Physicians were also called *angadkārs* because they treated cases of poisoning. Fevers, according to their characteristic attacked the patient daily, on alternate days or after every two days. The concept of diseases due to *vāta*, *pitta* and *kapha* had developed by that time. Names such as Jatukarna, Prāśara and Agniveśa, which are mentioned in *Charaka*, are mentioned here, too. It appears that by the time of Pānini, people were conversant with Agniveśa and other disciples of Ātreya and their treatises.

Smritis or Dharmasastras

Based upon the teachings of the sages, the smritis provide snippets of medical interest. There are many *smritis*, the important ones are by Manu, Viśnu, Yajnavalakya and Nārada. *Manusmriti* forbids every body to accept food given by a physician. This is derogatory reference, which shows that the profession of physician was not considered respectable enough by him. Like common labourer, the physicians were punished for any negligence. The *Yajnavalakya smriti* describes the anatomy of the body. According to it, there are 360 bones, 700 *śiras*, 900 *sanayas*, 200 *dhamanis*, 500 muscles ; the *nādis* arise from the heart, their total number in the body being 72,000. About the development of the foetus, it states that the soul enters the foetus in the third month ; *ojas* moves to and fro between the mother and the foetus in the eighth month ; it is because of this that the foetus delivered in the eighth month does not survive. This view is similar to that of *Charaka saṃhitā*.

Puranas

The *purānas* also refer to the practice of medicine. A majority of them seem to belong to a period of the Guptas. Some of them were written earlier, and some others in second millennium A.D.

The *Brāhama Vaivarta Purāna* describes the genesis of Āyurveda thus : Brāhama created it and then passed it on to Bhaskara who taught it to his sixteen pupils. No mention is made here of Bharadwāja. Dhanvantari, Devodasa and Kasiraj are mentioned as different persons. *Agni Purāṇa* contains some verses that are similar to those of *Charaka samhitā*. It mentions veterinary medicine also for the, treatment of horses and elephants. Oxides of metals (*bhasma*) formed part of the pharmacopoeia. *Garuda Purāna* describes different types of precious stones, their recognition and their influence on the person who wears them. It also mentions *Aśtānga Hridya* of Vāgbhata. *Skand Purāna* describes the construction and equipment of the hospitals (*arogya-śālā*) and the religious benefit that accrues to one who has them built. It also describes the qualities of a good physician. The methods of collection and preparation of medicines are also given.

Treatise of Kautilya

Arthaśāstra treatise is said to have been composed by Kautilya (Chanakya) who placed Chandra Gupta Maurya on the throne of Maghada in the fourth century B.C. From the internal evidence of the book, however, it appears that the available treatise was composed some time in the middle of the third century A.D. The book deals with the subject of governance of the State, but it also describes some aspects of medical practice and health conditions of the time. The physician who undertook to treat a serious patient without informing the king beforehand, got severe punishment if the patient died. Neglect, if proved, in such a case was punished with a penalty equal to assault or violence.[1] Carelessness or inefficiency on the part of even a veterinary surgeon was punishable with a fine equal to the value of the animal.[2]

Anybody who sold rotten meat, or flesh of animals killed outside the slaughter houses, or of animals which died suddenly, was liable to a heavy fine.[3] Those who threw refuse from the house in the streets, were also punished.

A census of the population was taken periodically and the record maintained by the district and village officers : "Having numbered the houses as tax-paying and non-tax paying, he shall not only register the total number of inhabitants of all the four castes in each village but also an account of the exact number of cultivators, cowherds, artisans, labourers, slaves and biped and quadruped animals. He shall also keep an account of the number of young and old men that reside in each house, their history, occupation, income and expenditure".[4] Spies deputed by the Collector-General ascertained the authenticity of the data collected by the village and district officers.

The *Arthaśāstra* describes in detail the signs and symptoms of poisoning. It describes the measures that a royal-physician should take to prevent the king from being poisoned, which was not an uncommon event. The *Mudra Rakshasa,* a famous Sanskrit drama written by Visakhadatta in the fifth or sixth century A.D., describes one such incidence in which Abhayadatta, the royal-physician of the Nanda kings, tries to poison emperor Chandragupta, but is saved by the presence of mind of Chanakya.

Rak : And what of our physician, Abhayadatta ?
Vir : His tasks are all accomplished.
Rak : Is Chandra-gupta dead ?
Vir : No, Fate has saved him.
Rak : What meant your words ?
Vir : I will appraise your Excellency. The poisoned draught had duly been concocted, and would have been administered but Chanakya, in pouring it into a golden goblet, observed the colour change, and thus detected the venomous admixture; then forbidding the prince to taste it, ordered the physician to swallow his own dose, and thus he died.

In his travelogue, Megasthenes, the Greek ambassador in the Mauryan Court, mentioned about the Indian physicians during the reign of Chandragupta Maurya. He said that they had medicines by which one could beget many children, and also determine and regulate the sex of the unborn child. His references to Indian medicine and medical men are generally complimentary.

Buddhist Literature

Buddhist religious books such as *Vinaya pitaka, Deepavamsa, Mahāvamsa* and others provide glimpses of the practice of medicine among the Buddhist monks during the lifetime of the Buddha and afterwards.

Vinaya pitaka deals essentially with the rules and regulations applicable to the monks. It has in it two sections called *Mahāvāgga* and *Chullavāgga*. *Mahāvāgga*, in a chapter entitled 'on Medicaments' lists the instructions and guidance given by the Buddha to the monks. It describes four different procedures of making a patient sweat. A house called *Jantagar* is also described *in Chullavāgga* where people could go for the sweat-treatment. *Mahāvāgga* also describes the operation of blood-letting with the help of a horn. It gives clear instructions about the care of the patient.

The *Mahāvāgga* relates two case histories which relates to the instructions of the Buddha about treating boils and wounds. In one case a monk had boils. The Buddha allowed the use of lancet, decoctions of astringent herbs, sesamum salve, and compresses and bandages for covering wounds. When the sore began to itch, sprinkling of mustard powder on the affected part was allowed; when the sore became moist, it was allowed to be fumigated; when a tumorous growth appeared on the wound, the Buddha allowed monks to cut it off with a lancet. When the wound did not heal, the Buddha allowed the use of oils. In fact, he allowed all sorts of treatments to be tried on the wound.[5]

In the second case, a monk was suffering from fistula and the physician Ākaśagotto cut it with a lancet. While going round, attending the sick monks, the Buddha came across this monk. Akaśagotto, the physician, requested the Buddha to have a look at the *bhikśu's* orifice, which was like the mouth of an igunana. And the Blessed one thinking, "this foolish fellow is making fun of me", kept quiet and turned away. He called a meeting of the monks and asked them : "Is there, *O bhikśus*, in that *vihara* a *bhikśu* who is sick ?" "There is Lord", was the answer. "What is the matter, *O bhikśus*, with him"? "That Venerable One, Lord, has a fistula, and Ākaśagotto, the physician has been lancing it," said the monks.

The blessed Buddha rebuked the patient, saying, "This is improper, for that foolish one, unbecoming, indecent, unworthy

of *samanas*, not allowable, and ought not to be done. How can this foolish fellow allow a surgical operation to be performed in that part of his body ? The skin there is tender, the wound is difficult to treat, the knife is difficult to guide. This will not redound to the conversion of the converted." And having rebuked him, the Blessed One, after delivering a religious discourse, said to the *bhikśus*: "You are not to allow a surgical operation to be performed upon you in that part of your bodies. Whosoever allows that is guilty of a *thullakkaya* offence".

Some time later, the Khabhaggiya *bhikśus* used a clyster. The Buddha got this information. "Is it true, O *bhikśus*, that the Khabbaggiya *bhikśus* use a clyster ?" "It is true, Lord," they said. He rebuked them, and having delivered a religious discourse, said to the *bhikśus*: "No surgical operation is to be performed within a distance of two inches round the anus and a clyster is not to be used. Whosoever does that, is guilty of a *thullakkaya* offence".

The above incidents indicate that the Buddha had not absolutely forbidden the use of the lancet. But as on certain parts of the body certain diseases did not heal very well after surgery, about which he himself had sufficient experience, he had forbidden a lancet to be used there.

The *Mahāvāgga* also gives an account of the physician Jivaka. It describes his birth, childhood, medical training and treatment of the Buddha and the monks by him.[6]

Jivaka was a famous physician of India in the sixth and fifth centuries B.C. He was said to be the son of Salavati, a courtesan of Rājagriha (near modern Patna) which was the capital of the Magadhan empire during the reign of Bimbisara. After his birth, Jivaka was thrown on a dust heap where people noticed that he was still alive (*jivati*). The matter was reported to the prince Abhaya, son of Bimbisara. The prince gave him the name Jivaka and had him brought up under his own care. That is why Jivaka is also described as Jivaka Kumarabhacca, meaning 'the one brought up by the prince'.

When he grew up, Jivaka learnt of his antecedents and without informing the prince left for Taxilā, the famous Indian centre of learning at that time, situated near Rawalpindi (now in Pakistan). There he studied medicine for seven years under a 'world-renowned

physician'. At the end of the final semester he underwent a sort of practical examination. His teacher asked him to take a spade and go round Taxilā for one *yojana* on every side and seek and bring to him any plant which did not possess medicinal properties. Even after a good deal of investigation, Jivaka could discover no such plant and reported the matter to his teacher. His teacher was satisfied and gave him the licence to practise medicine and also a little money which could only meet part of his expenses for the journey to his home town. This money sufficed to bring Jivaka up to Saket (near Faizābād district in the U.P.) where he started his medical practice.

Jivaka's first patient was a merchant's wife who was suffering from a chronic disease of the head for several years. Many physicians had examined her but could not restore her to health. They had received large quantities of gold as fees and gone away. Jivaka, being young in age and apparently inexperienced, was given permission to examine her with reluctance. He, however, took one handful of clarified butter (*ghee*), mixed some drug in it, boiled it and administered it to the patient through her nose while she was lying on her back in bed. *Ghee* given through the nose came out of the mouth and the patient spat it out. She was cured at once. For this cure, Jivaka received sixteen thousand *kahapanas* (copper coins), a man-servant, a maid-servant, and a coach with horses. When he reached Rājagriha, he presented these gifts to his patron prince, Abhaya. The prince was pleased with him and asked him to set up practice in his palace.

At that time, King Bimbisara was suffering from an anal fistula. Noticing stains of blood on his garments, his queens ridiculed him by saying that His Majesty was having menstruation, and would deliver a child in due course. The king was desperate. He wanted to get cured. Jivaka was consulted. He took some medicine on his finger and with just one application cured him. The emperor gave him as reward all the ornaments of his five hundred wives, and appointed him royal physician and also physician to the Buddha and the monks.

When Chandapajjota, emperor of Avanti kingdom in central India, was ill with jaundice, Bimbisara lent Jivaka's services to him. Chandapajjota hated *ghee*, which was the only remedy in his case. Jivaka prepared the medicine, prescribed it for the king and then

rode away on the king's elephant before the king discovered the nature of the medicine. Pajjota, in a rage, ordered his capture and sent his slave after him. The slave met Jivaka while he was having his breakfast at Kosambi. Jivaka offered him half a fruit of myrobalan which he himself was eating. Unsuspectingly, the slave took the fruit and ate it. Immediately he started having loose motions and requested Jivaka to save his life. Jivaka told the slave why he had fled from the king's presence and promised to cure the slave, provided he let him go away. Both agreed to the proposition, and Jivaka, after curing the slave, proceeded to Rājagriha. When Pajjota got cured, as a token of his appreciation, he sent Jivaka a suit of *siveyyaka* cloth, which Jivaka presented to the Buddha.

Jivaka is said to have performed surgical operations as well. At Rājagriha, there was a merchant who had been suffering from a severe head disease and had been told by the leading physicians that he would die on the fifth or seventh day. He approached King Bimbisara and requested that he be seen by the royal physician, Jivaka. Permission being granted, Jivaka examined him and then told him that after he had been operated upon, he would have to lie down on his left side, right side and the back for twenty-one months, seven months in each position. The patient agreed, and Jivaka performed the operation on the head. From inside he pulled out two worms which would have entered his brain in a few days and killed him.

After the operation the patient could lie for seven days in each of the above positions and expressed his inability for further rest. Jivaka then told the patient that that was enough and explained that he had initially asked for a longer period of rest just to make him endure patiently the required period of rest for twenty-one days only. The patient was cured and as a reward offered to give to Jivaka all that he possessed and also to become his slave. Jivaka, however, accepted only a hundred thousand *kahapanas* for the king and the same amount for himself.

Jivaka is also said to have performed an abdominal operation on one of his young male patients who had developed a twist of the intestines caused by a gymnastic feat. The patient could digest nothing and his bowel movement became irregular. He grew lean, disfigured, pale complexioned, and his veins almost burst out.

Jivaka examined him carefully and then ordered the people to leave the room, drew the curtain, tied the patient to a pillar and then cut through the skin of the belly, drew the twisted intestine out and disentangled them properly. He then put them back in their correct position, stitched the skin together and applied an ointment on the wound. Soon the patient recovered. For this operation, Jivaka was paid sixteen thousand *kahapanas*.

Jivaka was a contemporary of the Buddha and was greatly attached to him. Once when the Buddha was ill due to a disturbance of *doṣas*, Jivaka suggested that fat be rubbed into the Buddha's body for a few days. After that he gave him a handful of lotuses to smell which were to act as a light purgative. Jivaka was away when the purgative acted and suddenly he remembered that he had forgotten to ask the Buddha to bathe in warm water to complete the cure. The Buddha read his thoughts and bathed as required.

The Buddha's foot was once injured by a splinter from the rock hurled by Devadatta and he had to be carried from Maddakucchi to Jivaka's *ambavanā* (mango grove). There Jivaka applied an astingent medicine, and having bandaged the wound, left the city expecting to return in time to remove it. But by the time he returned, the city gates were closed and he could not enter. He was upset because he knew that if the bandage remained overnight, the Buddha would suffer intense pain. But the Buddha read his thoughts and removed the bandage.

Jivaka's fame as a physician brought him more work than he could cope with. He, however, never neglected his duties to the Buddhist monks. Many sick people, unable to pay for the treatment, became monks in order that they may receive treatment. Jivaka was declared by the Buddha as the chief amongst his lay followers. He was also included in a list of saints due for the realisation of immortality. At Jivaka's request the Buddha enjoined upon the monks to take physical exercises to ward off their unhealthy pale look which they had developed. Jivaka was keen to visit the Buddha twice a day. Finding the distance too much, he built a monastery with all its adjuncts in his own mango-grove at Rājagriha and presented it to the Buddha and his monks.

After the death of Bimbisāra, Jivaka continued to serve Ajātaśatru and was responsible for bringing him to the Buddha after

he (Ajātaśatru) committed patricide.

The *Deepavamsa* and the *Mahāvamsa* are the two Ceylonese Buddhist chronicles based on ancient historical tradition. The *Deepavamsa* seems to have been compiled from an older work about the fourth century A.D. *Mahāvasma* is a later, more accurate and precise work, based on the same material from which the *Deepavamsa* was made. This came into being in the beginning of the sixth century. These two chronicles deal with matters of medical interest, as for example, emperor Ashoka's arrangements for procuring medicines and distributing them among the sick, and public health measures such as cleanliness of the city and provision of drinking water.

Other Buddhist scriptures that mention the practice of medicine are the *avadanas*. They form part of the religious literature of the Mahāyana sect of Buddhism. One such *avadana* called *Kunalavadana* describes a disease that emperor Ashoka suffered from and how its remedy was discovered.

Once the emperor became seriously ill. Faecal matter started coming out from his mouth and his whole body smelled of putrid matter. Thinking that he would die of this disease, he wanted to send for his son Kunala from Taxilā. Queen Tisharakshita was apprehensive as she knew that if Kunala came, he would kill her. She told the emperor that he should not worry much and she would get him well. He should, however, stop seeing his physician and depend upon her. The emperor agreed.

Queen Tisharakshita asked the physicians to bring a patient to her who had similar complaints. When they brought such a patient, she had him killed and then examined his whole body carefully. In his intestines, she saw a large worm which would occasionally obstruct the passage and thus cause the faecal matter to be thrown out by the mouth. She poured peppers, *pipali* and *sondh* on the worm, but it would not die. At last when she poured crushed onion over it, it died. Now the queen requested the emperor to take onion as a remedy for his disease. Initially he resisted saying that as a Kshatriya he could not take onion; but ultimately, he took it, and got rid of the disease.

Another *avadana* called *Dharmaruchyavadana* describes the case of a housewife who developed excessive appetite and her Brāhmin husband was afraid that it might be due to some evil influence. He

consulted physicians and priest-astrologers who ultimately told him that there was nothing wrong with his wife; she was exceptionally hungry because she was pregnant.

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4

Medical Education

In ancient India, a physician graduated to his profession through one of the following procedures : he learnt the art and science of medicine from a teacher as his apprentice; he joined a *gurukala*, a residential school situated in the forests away from the crowded habitations, he enrolled himself as an understudy at the university of Taxilā, or Kāśi (Varanasi) or Nalanda.

Foreigners who came to India for higher education have given accounts of some of the centres of medical studies situated in the cities.

Taxilā, situated about 20 miles west of Rawalpindi (now in Pakistan), was the most important seat of learning in ancient India dating from the sixth century B.C. It attracted students from all corners of India : Rājagriha, Mithila, Kāśi, Ujjain, Kuru, Koshala, etc. Its fame had spread far and wide to foreign countries. Students from there came to Taxilā for study.

There are glorious accounts of Taxilā written by foreigners. Pliny calls it a famous city; Strabo collaborates him. Marrian describes it as a large and wealthy city and the most populous between the Indus and Hydaspes (Jhelum). Vincent Smith in his *History*, says, "It was the leading seat of Hindu learning where crowds of pupils from all quarters were taught the three Vedas and the eighteen accomplishments. It was the fashion to send princes and the sons of the well-to-do Brāhmins on attaining the age of sixteen, to complete their education at Taxilā, which may be properly called a university town. The medical school there enjoyed a special reputation and all arts and sciences could be studied under the most eminent pro-

fessors." Some of the most learned men in ancient India are said to have either graduated from Taxilā or were associated with it. These included Ātreya, Chānakya (Kautilya), Pānini, Jivaka, Vyadi, Kumaralabdha, Aśvaghosa, Deva, Nāgārjuna, Brāhmadatta, Junaha.

Nalandā was another centre of learning which flourished during the fifth to the twelfth centuries A.D. Chinese pilgrims Hiuen Tsang and I-Tsing who came to India during the reign of emperor Harsha and a little later, have left some accounts of it. Hiuen Tsang who stayed in India between 629 and 645 A.D., spent five years as a student at Nalanda. I-Tsing spent ten years between 675 to 685 A.D. at Nalanda. Hieun Tsang states that students from China, Korea, Tibet, Bokhara, Mongolia and Japan came to Nalanda to learn and they went back to their countries 'highly learned'. Admission here was difficult; only about twenty per cent of the admission-seekers were admitted. To be a student of Nalanda was in itself an academic distinction and those who bore the title of 'Nalanda brother' were treated with respect everywhere.

Nalanda was a huge institution. The area covered by it was a mile long and half a mile broad. It was enclosed by a high wall. The buildings were well planned. There were eight big halls and 300 lecture rooms. Some of the buildings were said to be six-storeyed. A big library occupied three buildings. Ten thousand students and over 1,500 teachers resided in and around the institution. Food, clothing and tuition was free; this was supported by huge grants made by the rich people and the kings.

To be a teacher of medicine in these institutions required high professional qualifications and personal qualities. He was supposed to have been taught by a holy teacher, to be gentle in appearance and behaviour, proficient in secular and spiritual knowledge, be a good observer and discussant, be able to comment upon different aspects of medicine, solicit good of the pupil, should not indulge in any other career, and above all, should retain the qualities of a pupil all his life.[1] The *Charaka Samhitā* lists these requisites more elaborately. According to it, the teacher should be one whose doubts in respect of medical scriptures have been cleared; he should be possessed of experience; he should be clever ; he should be compassionate towards those who approach him ; he should be pure of conduct ; he should have a practised hand ; he should have all the

implements of the profession; he should have all the organs of sense; he should be conversant with the nature of health, of disease, of medicaments, of time, of place, of men, etc.; he should be conversant with the tendencies and acts of the healthy and the diseased; he should be one whose knowledge of medical science has been supplemented by knowledge of other branches of study ; he should be without malice ; he should be without a wrathful disposition; he should be capable of bearing privations and pain; he should be very considerate towards disciples and disposed to teach them ; he should be capable of communicating his ideas to pupils that seek his instruction.[2] These qualifications even now would make an ideal teacher of medicine.

Great care was taken in the selection of the candidates for admission to these centres of learning. The most capable teachers were on the selection committee. The committee members were called *Dwara Pandits*, i.e., the learned sentinels.

The qualities sought in a student were : patience, politeness, purity of body and mind, birth in a good family, practice of *dharma* (duty), truthfulness, non-violence, absence of haughtiness and envy, celibacy, aptitude and intention to acquire basic knowledge and to carry out instruction of the teacher. A candidate belonging to the family of physicians was given preference. The prescribed age of medical students at the time of admission was sixteen. Before admission the candidate was supposed to have gathered proficiency in general education which included the study of the Vedas, the Brāhmanas, the Upanishads, the Sūtras, Sanskrit literature, Dharmaśāstra, Smritis (Law), arthaśāstra, Purānas, poetry, drama, phonetics, grammar, vocabulary, prosody, rhetoric, history, geography, philosophy, astronomy, astrology, geometry, arithmetic, algebra, etc.

Having been selected for admission, the candidate was initiated into discipleship after a regular ceremony. During this ceremony, the teacher charged him in the following words : "You should give up lust, anger, avarice, folly, vanity, pride, envy, rudeness, deception, falsehood; idleness and all other reprehensible conduct. You should always have your hair and nails cut short, should put on red coloured cloth, lead a pure life, avoid sexual intercourse, and be ready to obey your superiors. You should remain, go about, lie down, sit down, eat and study according to my wishes and you should always be

ready to seek my welfare."[3] He admonished him with these words : "If you fail in your duty, you will be committing sin, and your learning will be fruitless."[4]

A student was required to wake up at or before dawn. He performed the necessary ablutions and saluted the gods, the seers, the cows, the Brāhmins, the guardians, the elders, the adepts and the teachers, and seated himself at ease on an even and clean ground. He concentrated his mind and went over what he had been taught already, repeating the lessons over and over again so that he acquired a correct understanding of the text.[5] When both the teacher and the student were ready, the former taught the latter either one-quarter, one-half, or a stanza (*śloka*) at a time, depending upon the capacity of the student to learn. The student then repeated the stanza many times in order to remember it. As far as possible each student was given such lessons separately. The teacher saw to it that the students not only learnt the lesson but also understood it. He impressed upon them the fact that learning by rote, without understanding the meaning of what was thus committed to memory, was like the ass carrying a load of sandal-wood and the labour involved was without profit. As the ass which carried the load of sandal-wood perceived the weight but not the fragrance of the wood, so the dunces who studied numerous manuscripts without understanding their meaning, bore their weight without an appreciation of the value of their burden.[6]

A student was asked to go through more than one manuscript. Vāgbhata says : "If a man be well read in the *Charaka* but ignorant of even the names of diseases described in the *Suśruta* and other works, or if he be not wanting in practical methods but wholly ignorant of the *Charaka*, what can such a poorly-equipped man do to relieve the ailments of patients."[7]

Practical training of the student had three objectives : (1) preparation of medicines, (2) training in surgery and (3) examination of the patients. The student learnt the art of preparing flower juices and liquors, concocting different herbal combinations, making medicines using sugarcane or clarified butter (*ghee*), grinding stones, minerals and other materials into powder, preparing combination of minerals and herbs, combining and isolating minerals, making new compounds of minerals and extracting alkalies out of minerals. He

was also trained in planting, grafting and general care of plants, as also recognising different herbs and when and how to cut and preserve them.

For practical training in surgery, different surgical procedures were taught on dummies : incisions were taught by making cuts on gourds (*puśpaphala, alavu*) watermelon, cucumber ; excisions were demonstrated by making openings in the body of a full water-bag or in the bladder of a dead animal or in the side of a leather pouch full of slime or water ; scraping was taught on a piece of unshaven skin, venesection was taught on the vein of a dead animal, or with the help of a lotus stem ; probing and stuffing was taught on worm-eaten wood, reed bamboo, or the mouth of a dried gourd ; extracting was taught by withdrawing seeds from the kernel of a fruit such as jack fruit, as well as by extracting teeth from the jaws of a dead animal ; evacuating was taught on the surface of a *śalmali* plant covered over with a coat of bee's wax ; suturing was taught on pieces of cloth, skin or hide ; bandaging or ligaturing by tying bandages round the limbs and on a full-sized doll made of stuffed linen ; tying up a severed ear-lobe was demonstrated on a soft severed muscle or on flesh, or with the stem of a lotus lilly ; cauterising or applying caustic preparations was demonstrated on a piece of soft flesh; the art of inserting syringes and injecting enemas into the region of the bladder was taught by asking the student to insert a tube into the mouth of a gourd.[8]

Equal importance was given to theoretical and practical training : a person devoid of or deficient in either was considered ill-equipped for the practice of medicine. According to the *Suśruta,* "a person well-versed in theory but inadept at practice is confused when facing a patient, just as a weak-hearted person is confounded when confronted in a battle. Similarly one who is an expert at practical work but who is devoid of theoretical knowledge, is not respected in the company of learned persons and may get death sentence from the king. Such persons are inexpert, unable to perform their duties and know only half their science. They are like one-winged birds".[9]

Discussion and exchange of ideas with those having similar interests, was regarded a very good method of learning. According to the *Charaka,* it helped clarity of understanding, increased dialectical skill, broadcast reputation, dispelled doubts regarding things heard

by repeated hearing, and confirmed the ideas of those that had no doubts. It enabled one to hear a few new things in the course of discussion. Sometimes, secret meanings which the teacher imparted to the ministering disciple in a propitious moment gradually, were revealed by the excited disputant, desirous of victory, in the process of discussion. It was because of all this that discussion with men of the same branch of science was applauded by the wise.[10]

Discussion, according to the *Charaka* is of two kinds : friendly discussion and hostile discussion. A friendly discussion was encouraged with a person who possessed knowledge and experience, was easily persuaded and was an adept in the art of persuasion, had tolerance and pleasantness of speech. With such a person, one could talk confidingly and even enquire confidingly. During discussion, "having discomfited another, one should not rejoice. One should not boast before others. One should not get deluded by a partial or imperfect grasp of the subject. One should not expatiate on what the other is not at all acquainted with. One should persuade gently and in the spirit of goodness."[11]

A hostile discussion has also been recommended by the *Charaka* under certain circumstances and for such an occasion, he recommends the use of a few pungent remarks against the opponent : "Go and study for a whole year. Indeed, you have not properly attended to the instruction of your preceptor," or "This much is enough for thee." In such an encounter, once an opponent has been shouted down, one should not at all engage any more in debate with him.[12]

Another method employed in teaching was in the form of conducting seminars. In the *Charaka samhitā*, we come across the students, the teachers and the invited guests participating in discussions over one chosen topic of interest to all. The teacher is observed sitting amidst other sages and men of learning. Both the students and the sages participate and put forward their opinions. Towards the end, the teacher acting as chairman surveys the whole range of the subject in its various aspects and gives his final verdict on the subject under discussion. In a seminar in the *Charaka samhitā* on the subject of the 'Category of Taste,' different theories are put forward by the participants ; towards the end, Ātreya sums up the whole subject and gives his own opinion.[13]

A story told of Jivaka and his teacher Ātreya, illustrates the type of training imparted and the knowledge and efficiency expected of a student. Under the guidance of Ātreya, Jivaka learned everything splendidly. Whenever he visited his patients, Ātreya took a young Brāhmin along with him. One day he took Jivaka with him, gave him directions about the administration of certain drugs, and then came away. Jivaka perceived that his teacher had made a mistake inadvertently. He feared that if the patient took the medicine as suggested, he would die. A thought occurred to him and he soon left the house of the patient and came back after a while. He told the patient that he had met his teacher and he had suggested another remedy. When the patient was treated with the revised remedy, he felt better. The next time when Ātreya visited the patient, he asked him how he was getting on. On being informed that he was better, Ātreya suggested to him to continue the medicine. "Which medicine, the first or the second ?", the patient asked. Ātreya was at first puzzled, then asked, "What did I prescribe first and what afterwards"? The patient said, "You prescribed one medicine when you were present here ; about the other you gave orders to Jivaka." Then it occurred to Ātreya that he had made a mistake and Jivaka had perceived it and corrected it. He advised the medicine prescribed by Jivaka to be continued.

Ātreya was very happy with Jivaka, and thereafter took him along with him wherever he went. The Brāhmins' sons became envious and said, "O Teacher, you are well pleased with him because he is a king's son, and you bestow instructions upon him, but none upon us". He replied, "That is not the case. Jivaka possesses great intelligence and he is able to comprehend intuitively whatever I indicate to him." They said, "O Teacher, how do you know this ?" In order to demonstrate that, he said to the Brāhmins' sons, "Go and ask the price of various commodities ; you ask of such a one and you ask of such another." And having so spoken, he sent them off to the market. He also gave orders to Jivaka to ask the price of a certain article. The Brāhmins' sons did as they were told. Jivaka did likewise ; but while he was in the market place, he said to himself, "Suppose the master asks the price of other things, shall I be able to reply ? I should make myself acquainted with the price of other commodities as well." And this he did.

When all the students returned, they told the teacher about all they were supposed to have found out. Then Ātreya began to ask the price of articles which he had not particularly mentioned to them, saying to each of them, "O Brāhmins' son, what does this commodity cost ?" What does that commodity cost ?" They could not answer. But when he asked Jivaka, he gave a complete and satisfactory answer. Then Ātreya addressed his pupils : "O Brahmins' sons, have you heard ? Behold, this is the reason, why I said that Jivaka as he is possessed of remarkable insight, intuitively comprehends the whole situation."

Another story highlights the sharp observation and intelligence of Jivaka. Once he and his fellow students were returning after taking bath in the river when they noticed the foot-prints of an elephant on the way. When his colleagues asked him about the nature of the foot-prints, he observed them for a while and then said that they belonged to a female elephant who was blind of the right eye and was about to give birth to a male calf. Further, a woman who was blind of the right eye was riding on it and she was also going to give birth to a son on the same day.

Jivaka's remarks were reported to Ātreya amidst laughter of the students, and Ātreya asked Jivaka to substantiate his remarks. Jivaka explained the basis of his conjecture. He said that the foot-prints of the male elephant were round and that of the female oblong. Since this elephant ate grass only at the left side, it indicated blindness of the right eye. Because the hind foot-prints were more marked than those of the front, this indicated that she was pregnant. Compared to the left, the foot-prints of the right-side were more marked, it indicated that she was due to give birth to a male calf. Her urine indicated that she was going to deliver very soon. In the same manner, Jivaka explained his inferences about the woman riding on the elephant.

So far as the period of training of a medical student is concerned, we know that in the instance of Jivaka, it lasted for seven years. After the period of training was over, there was an examination including theory and practicals. Reference to a practical examination is found in a Tibetan tale. Here Ātreya asked his pupils "to go to the pine hill and fetch from it that which is no remedy". While other students did bring certain things, Jivaka came back empty-

handed, saying there was none that was not a remedy for one disease or the other. Jivaka was declared successful.

Theoretical examination was conducted by asking the candidate to explain a page from a manuscript. This particular page was marked by a rod ; hence this test came to be known as *Śalaka* test. The degrees were awarded to the successful candidates at a special ceremony (*samavartana*), during which they were charged about their future conduct and behaviour in the following words. This formed the medical oath of the time :

Medical Oath

Acting at my behest, thou shalt, conduct thyself for the achievement of the teacher's purpose alone, to the best of thy abilities.

If thou desirest success, wealth and fame as a physician and heaven after death, thou shalt pray for the welfare of all creatures beginning with the cows and Brāhmins.

Day and night however thou mayest be engaged, thou shalt endeavour for the relief of the patient with all thy heart and soul. Thou shalt not desert or injure thy patient even for the sake of thy life or thy living. Thou shalt not commit adultery even in thought. Thou shalt not covet others' possessions. Thou shalt be modest in thy attire and appearance. Thou should not be a drunkard or a sinful man, nor shouldst thou associate with the abettors of crimes.

Thou shouldest speak words that are gentle, pure and righteous, pleasing, worthy, true, wholesome and moderate. Thy behaviour must be in consideration of time and place and heedful of past experience. Thou shalt act always with a view to the acquisition of knowledge and the fullness of equipment.

No persons who are hated by the king or who are haters of the king or who are hated by the public or who are haters of the public, shall receive treatment. Similarly those that are of very unnatural, wicked and miserable character and conduct, those who have not vindicated their honour and those that are on the point of death, and similarly women who are unattended by their husbands or guardians shall not receive treatment.

No offering of meat by a woman without the knowledge of

her husband or guardian shall be accepted by thee. While entering the patient's house, thou shalt be accompanied by a man who is known to the patient and who has his permission to enter, and thou shalt be well-clad and bent of head, self-possessed, and conduct thyself after repeated consideration. Thou shalt thus properly make thy entry. Having entered, thy speech, mind, intellect and senses shall be entirely devoted to no other thought than that of being helpful to the patient and of things concerning him only. The peculiar customs of the patient's household shall not be made public. Even knowing that the patient's span of life has come to its close, it shall not be mention by thee there where if so done it would cause shock to patient or to others.

Though possessed of knowledge one should not boast very much of one's knowledge. Most people are offended by the boastfulness of even those who are otherwise good and well informed.

There is no limit at all to which knowledge of Āyurveda can be acquired, so thou shouldst apply thyself to it with diligence. This is how thou shouldst act. Again, thou shouldst learn the skill of practice from another without carping. The entire world is the teacher to the intelligent and the foe to the unintelligent. Hence knowing this well, thou shouldst listen and act according to the words of instruction of even an unfriendly person, when they are worthy and such as bring fame to you and long life, and are capable of giving you strength and prosperity.[14]

To the above charge, *Suśruta samhitā* adds : "The twice-born (Brāhmin), the preceptor, the poor, the good and the destitute—these thou shalt treat when they come to thee like thy own kith and kin and relieve their ailments with thy medications. Thus behaving, good will befall thee. Thus thy learning will attain popularity and will gain for thee friends, fame, righteousness, wealth and fulfilment.[15]

Before a qualified physician could start practice, he had to have the permission of the king. This was to safeguard the people from the nuisance of quacks.

officiousness. They make it known that they expect little by way of remuneration. On being entrusted with a case, they look about on all sides repeatedly to cloak their ignorance.

"Finding themselves unable to check the course of the disease, they give it out that it is the patient himself who is wanting in the necessary accessories, in attendance, and in self-control. When they realise that the patient is at death's door, they run away and seek another neighbourhood. In the presence of uncultured people they brag about their adroitness in the most unadroit manner, and like the ignoramuses that they are, they run down the learning of the savants.

"But if they sight a company of learned, they slink away from a distance, like a roadster at the sight of a dark wood. If by any chance they happen to have conned a stray maxim, they constantly quote it, in season and out of season. They can brook neither being questioned nor questioning others. They dread all questions as if they were the very devil. People such as these know not either teacher, disciple, co-student or disputant.[17]

"Such people putting on the garbs of physicians, dupe their patients, just as the bird-catcher in the forest dupe the birds by camouflaging themselves in nets. They should be shunned, for they are the messengers of death on earth.[18]

"One may survive the fall of a thunderbolt on one's head but one cannot expect to escape the fatal effects of medicine prescribed by an ignorant physician."[19]

Fees

The Brāhmin, the preceptor, the poor, the friend, the recluse, the sage and the helpless were entitled to free treatment and medicine. Others had to pay the physician for his services. How much were the fees and whether they were paid by the patients in cash or in kind, we do not know for certain, because the ancient treatises are not specific on this subject. As a general rule, the *Charaka* emphasized that medical practice should be humanitarian in outlook and should be practised mainly for acquiring merit, wealth, or pleasure. A medical teacher should be like a mango tree that gives all its fruits to others and retains none for itself.[20]

We know of at least one specific instance of payment of fees.

Jivaka, was paid 16,000 *kahapanas*, a maid-servant, a man-servant and a coach with horses for treating and curing the wife of wealthy merchant at Saket. For an operation on the head of another merchant, he was paid 100,000 *kahapanas*. Jivaka was a physician to the emperor Bimbisara and the Buddha. He charged nothing from the Buddhist monks as a matter of principle.

References

1. *B.D.H.M.*, 1. 1. 5.
2. Ibid, 1. 1. 5.
3. *C.S.* 3, 8.
4. *S.S.*, 1, 2.
5. *C.S.*, 1. 4.
6. *S.S.*, 1. 4.
7. *A.H.* utt., 40, 84.
8. *S.S.*, 1. 9. 2.
9. *S.S.*, 3. 48-50.
10. *C.S.*, 3. 8. 15.
11. *C.S.*, 3. 8. 17.
12. *C.S.*, 3. 8. 20.
13. *C.S.*, 3. 26.
14. *C.S.*, 3. 8. 13.
15. *S.S.*, 1. 2. 8.
16. *C.S.*, 1. 29. 7.
17. *C.S.*, 1. 29. 9.
18. *C.S.*, 1. 29. 10-11.
19. *C.S.*, 1. 1. 128.
20. *C.S.*, 1. 30. 24, see also I.J.H.M., 5. 21.

5

Personal Health

Ancient Indian physicians attached great importance to cleanliness and correct diet in normal health and during illness.

Dental care was a must every morning. The tooth-brush, according to the *Suśruta,* should be made of a fresh twig of a tree or a plant grown on a commendable soil and it should be straight, not worm-eaten, devoid of any knot (or at the most have one knot only), should be twelve fingers in length and about the small finger in girth. Vāgbhata recommends twigs of *Calotropis gigenta* (*arka*), banyan, *Acacia catechu* (*khadira*) *Ongamia glabra* (*karanja*), etc.[1] After cleaning the teeth, one should use a thin, smooth, and flexible foil of gold, silver or wood, ten fingers in length, for the purpose of cleansing the tongue by scraping.[2]

Physical exercise, keeping one's finger-nails paired and hair cut short, wearing clean and white clothes and a light turban on the head, a pair of shoes, an umbrella to protect oneself from hot sun or rain—these were considered necessary for maintaining good health. Basking before a fire immediately after a meal or sitting on one's legs on a narrow wooden stool were forbidden.[3]

Daily use of collyrium to strengthen the eye-sight; nasal drops to increase the power of smell, oily gargles for the taste, oily ear drops for better hearing, massage of the body, head and feet with oil, were recommended for the preservation of a youthful body.

A betel leaf prepared with cloves, camphor, nutmeg, lime, arca-nut, *kakkola* and *katu kāhva*, etc., was recommended to be chewed after meals. It was said to cleanse the mouth, exude a sweet aroma, enhance the beauty of the teeth, strengthen the voice, tongue,

teeth, jaws, and the sense organs. It checked excessive salvation, soothed the body and acted as a general safeguard against throat diseases.[4]

Tobacco was not smoked, but ingredients, for smoking made out of fragrant herbals were considered to lighten the body and refresh the smoker. Garlands of fragrant flowers were advised to be worn. Spirituous liquors were taken in moderation; they were not entirely prohibited.

Vāgbhata recommends that one should not sneeze, laugh or yawn without covering one's mouth. Nose and ears should not be picked with fingers.[5]

The type of food, time of taking it, its quantity, combination, how it should be served, the material of the pots in which it was served, were all given due consideration. The *Charaka* and the *Suśruta* devote many chapters in describing the qualities and the effects of different articles of food.

If the water is unclean, it should be purified by boiling, exposure to the sun or by throwing hot iron balls in it. It can also be purified by putting into it seeds of *Strychnos potatorum* (*katakaphala* or *nirmālaya*), a kind of gem called *gomedaka*, root of *Nelumbium speciosum* (*visagranthi*) or of *Vallisneria spiralis* (*saivālamula*), etc. Water cleaned thus may be scented with flowers of *Mesua ferrea* (*nāgakeśara*), *Michelia Champaca* (*champaka*), *Nymphoea stellata* (*utpala*) and *Bignonia snaveslens* (*palata*).[6]

What type of food and drink is appropriate to each season of the year for different constitutionals of people is described in detail by the *Suśruta*.

During the rainy season, owing to a slimy condition of the body and an impairment of the digestive fire, the bodily *vāyu*, etc., the physical condition is far from perfect. Therefore, articles of astringent, bitter and pungent tastes are prescribed in this season. They remedy the altered slimy condition of the body and mitigate the aggravation of the bodily *doṣas*. The food should be solid or semi-solid, neither too fatty nor too dry. It should be composed of articles which are appetising. Water for drinking should be first heated and subsequently cooled; it should be taken in combination with honey if the sky is overcast with clouds and the air is humid. The vegetables, being fresh in this season, are over-juicy and consequently not easily

digestible. In this season, one should avoid excessive use of physical exercise, water, dew, sexual intercourse, and the direct sun-rays. While sleeping, one should try to avoid dampness under the bed. When feeling cold, one should protect oneself with warm clothes and should lie inside a room well-protected against the wind. Fine *aguru* should be used as paste on the forehead. Elephants should be used for conveyance. Sleeping during the day time and eating before the last meal is digested, should be strictly avoided.[7]

During the autumn months, one should use articles of astringent, sweet, and bitter tastes. They should include different preparations of milk and of sugar-cane juice as well as honey, *sali* rice, *mudga* pulse, oil, and meat of the wild animals. Any water is suitable in this season as it is clean and pure at this time of the year due to the effect of the moon and the rising of the Āgastya star. Swimming and bathing in ponds full of lotus and water lily, enjoying the moon's rays at dusk and the use of sandal pastes are recommended. The aggravation of *pitta* produced in the rainy season should be duly remedied by the use of *tikta-ghrita*, by means of venesection or by the use of purgatives. Strong articles of food as well as the sun's rays, sexual excess and sleep during the day time and keeping late hours should be avoided. Sweetened and cold water and purified wine as transparent as crystals are also recommended. Clean and thin clothes scented with sandal paste or with camphor as well as garlands of autumnal flowers should be worn; and the *sidhu* class of wine should be judiciously taken. In short, all *pitta* subduing measures should be taken in this season.[8]

During the winter, the bodily *vāyu* is aggravated and the *rasa* dries up. The use of oleaginous things is, therefore, beneficial in this season. Food should not be taken cold. Wine taken after pasting the body all over with *aguru* paste is beneficial. Baths should be taken in tepid water after massaging the body with oil. Large inner apartments surrounded by rooms on all sides and containing fire pots should be used as bed-rooms. The bed-sheets should be silken. Sufficiently warm coverings for the body should be used. Kings (and king-like personages) should be enclosed in the sweet embraces of maidens with big breasts and thighs and scented with the fumes of *aguru*, and they can, in this season, enjoy sexual pleasure to their hearts' content. Those who can afford should take rich,

healthy food. Sweet, bitter, pungent, and saline articles of food and drink, sesamum seeds, *masha* pulse, pot herbs, curd, different modifications of sugar-cane juice, scented and newly husked *sali*-rice, the flesh of different aquatic and wild animals, clean transparent wines and other invigorating food items are ideal for a person wishing vigour of the body and the mind at the advent of the cold season.[9]

During the spring, the bodily *kapha* already stored in the organism owing to the coldness of the body during the winter season, is aggravated by the increasing heat of the sun and consequently of the body, and this gives rise to many diseases. Acid, sweet, demulcent and saline articles of food and drink and those not easily digestible should, therefore, be avoided.

Shastika and *nivāra* and *kedrava* rice, barley, *mudga* pulse, along with meat or vegetable soups of brinjals, lemon leaves and other bitter vegetables should be taken in this season. All sorts of *asava* and especially the *asava* and *sidhu* wines prepared from honey should be freely used in the spring. Collyrium should be applied to the eyes, smoke should be inhaled and strong liquid used for gargling. Everything should be used with tepid water and a diet consisting of strong non-demulcent, pungent, alkaline, astringent, tepid and non-liquid articles and especially the preparation of barley, *mudga* pulse and honey would be beneficial.

Physical exercise in the shape of mock-fight, brisk walk, or the throwing of stones would be beneficial. Massage and bath are recommended. Sexual union may be enjoyed in this season. The bodily *kapha* stored in the body during the winter season should be eliminated by means of errhines, vomiting, *vasti* (enema) and gargles, etc. Sleep during the day and articles of food that are sweet, demulcent and liquid and those hard to digest should be strictly avoided.[10]

During the summer, excessive physical exercise and articles of diet which are hot and dry should be avoided. Bathing in tanks, lakes and rivers and respite in the gardens and cool rooms is beneficial. Sandal paste and garlands of flowers are refreshing ; so is the soft breeze from palm leaf fans. Necklaces of precious stones and pearls help fight the heat of the summer. Light clothes should be worn. Sweet-scented and cooling *panakas* and *manthas* (drinks) with abun-

dance of sugar should be taken. Sweet, liquid and cold food mixed with clarified butter, and boiled milk sweetened with sugar taken at night are not only tasty but also beneficial.

Rest or sleep on a bed dotted with blooming, fresh flowers in a well-ventilated room with ready access by cool breeze is a refreshing experience.[11] To heighten the cooling effect one may beswear one's body with sandal paste.

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6

Public Health

In order to maintain the state of public health in the principal cities of ancient India, Kautilya laid down specific rules and regulations. The importance given to municipal hygiene and cleanliness is much in evidence. Kautilya's *Arthaśāstra* states about the flow of dirty water from the house into the street sewer : "From each house a water course of sufficient slope at a distance of 3 *padas* (foot length) or 1½ *aratnis* from the neighbouring site, shall be so constructed that water shall either flow from it in a continuous line or fall from it (into the drain). Violation of the rule shall be punished with a fine to 54 *panas.*" About the cleanliness of the streets, it says : "Whoever throws dirt in the street shall be punished with a fine of one-eighth of a *pana*; whoever causes mire or water to collect in the street shall be fined one-fourth of a *pana*. Whoever commits the above offences in the king's road shall be punished with double the above fines. Whoever defecates in places of pilgrimage, reservoir of water, temples and royal buildings shall be punished with fine of one *pana* or above."

Unclean conditions inside one's house which could cause annoyance to the neighbours or the passers-by were also forbidden : "If a pit, steps, water-course, ladder, dung-hill or any other parts of a house offer or cause annoyance to outsiders, or in any way obstruct the enjoyment of others or cause water to collect and thereby injure the wall of a neighbouring house, the owner shall be punished with a fine of 12 *panas.* If the annoyance is due to voidance of faeces and urine, the fine shall be double the above. The water course or gutter

shall offer free passage for water, otherwise, the fine shall be 12 *panas*."

Sale of rotten meat was a punishable offence. The *Arthaśāstra* recommends cutting off of two legs and one hand of the offender, or a fine of 900 *panas*[1]. Such severe punishment must have deterred retailers from selling spurious, adulterated or otherwise harmful food items to the public.

The cause of epidemics was attributed to abnormal weather and winds, unhealthy water and soil. Unseasonal winds, be they violent or calm, too cold or too hot, too dry or too wet, blowing in contrary direction or of the whirlwind type and those laden with dust, sand and smoke, give rise to epidemics.[2] Water having an abnormal smell, colour, taste or feel, abounding in putrifying matter and in which the aquatic animals die or they leave it, causes epidemics.[3] Similarly, soils having abnormal colour, taste and touch or excessively damp, abounding in weeds, infested with mosquitoes, flies, locusts, mice and dogs, on which the sun, moon and stars are hardly visible because of dusty winds and clouds, or where the people have given up morality, character, truth, modesty, custom and virtue, or that which is full of cries, noise and lamentations of animals and men, is unhealthy and prone to epidemics.[4]

The *Bhela samhitā* gives specific instances of the regions and the diseases associated with them. "In the people living in the eastern region, who eat mostly fish and rice, the *kapha* and the *pitta* are predominant; elephantiasis and swelling in the front part of the neck (goitre) are commonly seen in them. The people in the southern region who eat fish are usually afflicted with leprosy. The people in the northern region and in the Kambhoja country take lentil (*masura*), barley, wheat, sesamum and *koddala*; they frequently suffer from piles. The people of western region have an excessive appetite for meat, intoxicating drinks, sex, and over-exertion; consumption is common among them. The people of Bahlika country generally take meat which increases the slimy secretions of the body; they constitutionally have excessive secretions".[5]

Elephantiasis, according to the *Suśruta*, is peculiar to countries in which large quantities of rain-water remains stagnant during the greater part of the year making them damp and humid in all seasons.[6] This disease, as we know now, is caused by the bite of

filaria-infected mosquitoes which abound in places where water stagnates.

Clinics

A physician's clinic should be designed by an expert. The building should be sturdy and spacious. It should ward off wind except on one side. It should not be surrounded by high buildings and be away from smoke, heat, moisture, dust, and undesirable noise, sight and odour. A water tank, a kitchen, a bathroom and a latrine should be attached to it.

There should be attendants who are clean, have good conduct and character and have affection and sympathy for the patients. They should be skilled in the art of cooking soups and rice, in giving baths and shampoo, in lifting or laying the patient in bed, and in administering medicines. They should not be disinclined to any kind of work.

People who are well-versed in singing, playing of musical instruments, panegyrics, verses, stories, legends, history and mythology, should be available for the entertainment of the patients.

Attached to the clinic should be a farm populated with quail, grey partidge, hare, deer, black buck, black-tailed deer, hog deer and wild sheep, and healthy milch cow.

The equipment of the clinic should include a beaker, sipping spoon, tub pot, cooking pot, pan, jug, pitcher, bowl, saucer, ladle, mat, cover plate, frying pan, churning staff, skins, cloth, yarn, cotton, wool, beds and seats, kettle, spittoon, well spread bed sheets, coverlets, and cushions with pillows. It should have all the things needed for oleation, sudation, inunction, emesis, and purgation. It should have well-washed roller stone, well-polished, hard and medium-sized grinding slabs, instruments and other accessories, smoking-pipe, enema tube, tube for urethral or vaginal douche, broom, balances and measuring vessels.

Among the medicinals, it should have *ghee*, oil, animal fat, marrow, honey, treacle, salt, fuel, water, different types of wines, curds, whey diluted butter-milk, sour gruel and urines, *sali* rice, *sastika* rice, green gram, black gram, barley, sesamum, horse gram, jujube, grapes, white teak, sweet *falsah, Chebulic myrobalan, Emblic myrobalan* and *Beleric myrobalan*; different materials required for oleation and sudation procedures, drugs for emesis, purgation,

astringents and digestive stimulants, digestives, sedatives, drugs curative of *vāta* and other drugs described previously.

All the above accessories and remedies for emergency treatment should be kept ready, as also the things that are useful in after-treatment. All the medicinals and equipment should be kept ready because it may not be easy to obtain immediately the stock of remedies needed in the event of an emergency developing in a disease, even if the means to buy them be available.[7]

There are clear guidelines for the construction and equippage of special clinics such as child clinic, delivery-room and post-operative room.

For a child clinic, the building should be spacious, beautiful, full of light, well ventilated but free from draughts, free from beasts of prey, animals with fangs, mice and insects. Separate places should be assigned for bathing, cooking, urination and defection. Pious old men, considerate physicians and devoted attendants should be constantly available. Beddings, bed-covers and pillows should be soft, light, pure and scented and suitable to the season. These should always be free from sweat, dirt, worms, bugs, urine and faeces. If repeated change of new clothes is not possible, the soiled coverings should be well washed and dried before they are used again.

To purify the dress, beddings, coverings and sheets by fumigation, the following medicinals may be used with clarified butter : barley, mustard seeds, linseeds, asafoetida, *gugguls* (*Bal samodendron* Mukul), *vacha* (*Acorus calamus*), *coraka* (*Andropagon acicularis*), *vayastha* (*Chebulic myrobolan*), *golomi* (*Panicum dactylon*), *jatita* (*Nardostachys jatamansi*), *palankasa* (a variety of *guggula*), *ashoka* (*Saraca indica*), *rohini* (*Picrorrhiza kurroa*), and snake's skin.

A variety of toys to please the child should be at hand; these should be coloured, light musical, beautiful and must not be sharp-pointed; they should be of such a size and shape as cannot be put into the child's mouth or do not terrify or harm the child. Auspicious ceremonies such as *homa*, propitiation of gods for proper protection of the child should be performed at the clinic.[8]

The delivery-room should be located on a site free from bones, sand and broken bits of earthen vessels. It should face east or north. It should have around it *bael*, *falsah*, mango, putranjiva, marking-nut, three-leaved caper and catechu and other trees which the Brāhmins,

who are knowers of the *Atharvaveda*, recommend. It should be well-built, well-plastered, and well-furnished with doors and windows and in accordance with the principles of house building. There should be arrangements for a fire place, water storage, pounding, lavatory, bath room and kitchen.

It should be equipped with the following articles : *ghee*, honey, rock salt, *sanchal*, black and *bid* salts, embelia, costus, deodar, ginger, long pepper, the roots of long pepper, elephant pepper, Indian penny-wort, cardamoms, glory lily, sweet flag, white-flowered leadwort, asafoetida, rape seed, garlic, clearing nut, linseed, *balvaja*, birch, gram and *maitreya* and *sura* wines. Two grinding stones, an untamed bull, two gold or silver cases for keeping sharp needles, sharp metallic instruments, two bed-steads made of *bael* wood. There should be faggots of mango steen and *zachum* oil plants for making a fire.

A clinic should have female attendants who are mothers of many children, sympathetic, constantly affectionate, of agreeable behaviour, resourceful, naturally kind-hearted, cheerful and tolerant of hardships. There should also be present Brāhmins who are knowers of the *Atharvaveda.* Whatever else is thought to be necessary should be kept; also whatever else the Brāhmins and old women advise, should be carried out.[9] The *Suśruta* recommends a special room for patients needing surgery. Patients suffering from surgical diseases such as inflammatory swellings, wounds, etc. should, from the very beginning of their illness, be confined inside a clean room situated in a healthy locality, free from draughts and not exposed to the glare of the sun, for in such a building, constitutional, mental and accidental diseases are not likely to occur. The beds of the patients should be soft, spacious and well-arranged. The patient should lie down with his head pointing towards the east, and keep there some weapon for his own protection. On such a bed, the patient can lie comfortably with his dear friends by his side, for their sweet words relieve the pain of inflammation ; female friends, however, should be avoided and kept at a distance. He should observe strictly the orders of the surgeon as regards his food, drink and mode of living. He should have his hair clipped and nails pared short, be pure in his person, put on white clothes and devote himself to religious duties.

A light should be kept burning, and garlands of flowers,

weapons, etc., should be provided in the room to ward off the demons. He should be cheered and inspired by pleasant stories, and the physicians and the priests should attend to the patient morning and evening. Pastils made of *Sinapis nigra* and *Azadirachta indica* with clarified butter and salt, should be burnt in the room morning and evening for ten days continually. The inflammed part should be fanned with a *chamar*, a yolk tail. Sleeping during the day, physical exercise, and sexual intercourse must on no account be indulged in.[10]

Hospitals

While it was customary in ancient times to look after and treat the patient in his own home, for those who had nobody to look after them, the State arranged for places where the sick were lodged and treated.

The Edict No. II of Ashoka (274-236 B.C.), reads : "Everywhere in the kingdom of the king Piyadasi, beloved of the gods, and also of the nations who live in the frontiers such as the Cholas, the Pandayas, the realms of Satyaputra and Keralaputra, as far as Tambapani and in the kingdom of Antiochus, king of the Greeks and of the kings who are his neighbours, everywhere the king Piyadasi, beloved of the gods, has provided hospitals of two sorts : hospitals for men and hospitals for animals".

Fa-hien (405-411 A.D.) who was a contemporary of Chandragupta, gives a description of the charitable dispensaries in Pataliputra. He states : "The nobles and house-holders of this country have founded hospitals within the city to which the poor of all countries, the destitute, the cripple and the diseased may come. They receive every kind of help free and freely. Physicians inspect their diseases, and according to their cases order them food and drink and medicines or decoctions, everything, in fact, that may contribute to their ease. When cured, they depart, at their convenience."

Hiuen Tsang (629-645 A.D.) who visited India during the reign of emperor Harsha states : "In all the highways of the towns and villages throughout India, he (the emperor) erected 'hospices' (*punya-śālās*), provided with food and drink, and stationed there physicians with medicine for travellers and poor persons to be given without any stint".

Such institutions, either regular hospitals for the poor and the

needy or poor houses equipped with medicines, were there in later times in the north as well as in the south. These were called *punyasthānas*, *punyaśālās*, *dharmaśālās*, the *vihāras* and the *maths*. They were the Indian equivalents of the western alm-houses, monasteries and infirmaries.

There is epigraphical evidence of the existence of dispensaries in the Deccan during the Pallava period between 574 and 879 A.D. Of the Chola period in the South (900-1200 A.D.), quite a few epigraphic findings are available which tell us of the grants given to the physicians and the village dispensaries and the town hospitals. Some of the hospitals were attached to the temples.[11] The records of the Cholas speak of the dispensary as *ātulasālai* or *vaidyasālai* ; *ātula* or *vidya* meaning medicine and *sālai* meaning an institution of charitable character. There were a large number of such dispensaries in villages. Most of them seem to have been manned by a local physician of hereditary nature, for whose maintenance there was provision of tax-free land, of which the records are available. Physicians were expected to attend to the medical needs of the people without expecting any return. Sometimes appointments of physicians were made by the king or the queen or by some religious institutions or local authority.

In one of the temple inscriptions of the Chola period, we find a detailed description of a hospital, a medical school and a hostel for the students. Veera Rajendra Deva of the Cholas issued a commandment in 1067 A.D., which is inscribed on the walls of the inner sanctuary of the temple of Venkateshwar at Tirumakudal in the district of Chingelput.[12] The hospital had fifteen beds for the treatment of the members of the temple, the students and teachers of the school. It was looked after by a physician (Kodani Rameshwathan Bhattar) who was paid annually 90 *kalam* of paddy and *kasu* in addition to a grant of certain land, for prescribing medicines to the patients lying in the hospital.

Besides the physician, there was one surgeon (Calliyakkiriyai Pannuvan) who was paid 30 *kalam* of paddy. Two other persons who fetched medicinal herbs for preparing medicines were paid 6 *kalam* of paddy and 2 *kasu* ; two attendants who attended the patients and administered medicines were each paid *30 kalam* of paddy and one *kasu*. A barber was paid 15 *kalam* of paddy for discharging his

professional duties. Besides the above, a provision of 2 *kasu* for a lamp to be kept burning in the hospital during nights, 15 *kalam* of paddy for the waterman and 40 *kasu* for stocking medicines in the hospital were also made. The ration supplied to the sick consisted of a *nāli* of rice per head per day. Twenty different medicines that were to be kept in store in the hospital are also clearly recorded in the inscription.[13]

Another Chola inscription of the year 1120 A.D. mentions of a *matha* attached to the temple of Tiruvaduturaiyudaiyar at Tiruvaduturai. Here, besides other subjects, students were taught *Aśtānga Hridya* of Vāgbhata and the *Charaka samhitā.*

A later inscription dated A.D. 1262, on a stone pillar of Malakapur in Andhra, contains references of medical interest. Kakatiya Queen Rudramma and her father Ganapati donated several villages to the south of River Krishna to Vishweshwara. The income accruing from these holdings was divided into three parts: Vishweshwara earmarked one-third of it for a maternity home, one-third for a hospital, and the remaining for a school.

The wealthy, the princes, and the kings who built hospitals and supported them with money were considered pious and philanthropist entitled for a high place in heaven.

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7

Anatomy

The knowledge of the anatomy of the human body in Āyurveda was necessitated for cases of surgical operations. For this the knowledge of anatomy of the whole of the body was not considered essential. It was enough if one knew the particular spots or areas of the body that should not be operated upon by a lancet, or else it would cause either excessive bleeding leading to death or disability. Knowledge of such sensitive (*marma*) areas was gathered through practical experience of operating upon patients. Āyurvedic surgeons had gathered an extensive knowledge about such sensitive areas in the human body. The *Suśruta saṁhitā* deals with the subject in great detail.

Regional Anatomy

A hundred and seven *marmas* have been located on the human body. The effect of injury to each one of them gives an idea of the regional anatomy as understood by Indian surgeons.

The *marmas* are the meeting place of any two or more of the five components of the body, viz., vessels, muscles, ligaments, bones and joints. The *marmas* are classified into five groups, namely, (1) *māmsa-marmas* (fleshy), 11 ; (2) *śira marmas* (of the vessels), 41 ; (3) *snāyu-marmas* (of the ligaments), 27 ; (4) *asthi-marmas* (of the bones), 8 ; (5) *sandhi-marmas* (vulnerable joints), 20.[1] Eleven of them are situated in each limb making a total of 44. In addition there are 12 in the region of the chest and abdomen ; 14 in the back ; 37 in the neck and above it.[2]

According to the effect of injury to them, *marmas* are divided into five categories : (1) *sadya-pranahara*, fatal result within 24 hours ;

(2) *kalantra pranahara*, fatal result within a fortnight or a month ; (3) *viśalyaghna*, fatal as soon as a dart of any other embedded body is extracted from them ; (4) *vaikalyakara*, causing deformity, and (5) *rujakara*, causing pain.[3]

Why a particular category of *marmas* has a particular effect after injury is due to its particular constitution. The *Suśrutā samhita* states : "*Marmas* belonging to *sadya pranāhara* are possessed of fiery virtues and as the fiery virtues are easily enfeebled if enjured, so they prove fatal soon. Those belonging to the *kalāntara pranāhara* group are fiery and lunar (cool) in their properties, and as the fiery virtues are enfeebled easily and the cooling ones take a considerable time, so the *marmas* of this group, if hurt, prove fatal after a longer time."

The *viśalyaghna marmas* are possessed of *vāta* properties. that is, they arrest the escape of the vital *vāyu* so that as long as the dart does not allow the *vāyu* to escape from their injured interior, the life continues ; but as soon as the dart is extricated, the *vāyu* escapes from the insides of *marmas* and then the injury proves fatal. The *vaikalya-kara marmas* are possessed of lunar properties and they retain the vital fluid owing to their steady and cooling virtues, and hence tend only to deform the organism in the event of their being hurt. The *rujakara marmas* of fiery and *vātaja* properties become extremely painful inasmuch as both of them are pain-generating in their properties.[4]

A detailed description of some of the important *marmas*, region-wise, according to the *Suśruta*, is as follows :

Of the *marmas* present in the extremities, the one called the *kashipra* is situated in the region between the first and the second toes. When this is injured or pierced, it causes death from convulsions. A perforation of the *gulpha marma* situated at the junction of the foot and the calf results in pain, paralysis, and lameness of the affected leg. An injury to the *indrvasti marma* which is situated in the middle muscle of the calf at a distance of twelve to thirteen fingers from the ankle, results in excessive haemorrhage causing death. An injury to or piercing of the *jānu marma* situated at the union of the thigh and the knee causes lameness. An injury to the *vitapa marma* situated between the scrotum and the inguinal region causes impotency.[5]

Of the *marmas* present in the thorax and abdomen, an injury to the *guda marma* which is attached to the large intestine and serves as

the passage for stool and flatus, ends fatally within twenty-four hours of the injury. An injury to the *vasti marma* present inside the pelvic cavity near the urinary bladder proves fatal within the day as the urine oozes out through the aperture when one of its walls is perforated. This, however, may be closed and healed up with proper and judicious treatment.

An injury to the *nābhi marma*, the root of all the *śiras*, and situated between the *amāśaya* (stomach) and the *pakvāśaya* (intestines) ends in death within the day. An injury to the *hridya marma* which is situated in the thorax between the two breasts and above the pit of the *amaśāya* proves fatal within the day. An injury to the *stanamula marmas* situated immediately below each of the breasts and about two fingers in width, fills the thorax with deranged *kapha*, brings on cough, difficult breathing and proves fatal. An injury to any of the *stana rohita marmas*, situated above the nipples of the breasts about two fingers in width, fills the cavity of the thorax with blood, producing symptoms of cough and asthma, and ends fatally. An injury to the *apalāpa marmas* situated below the axilla, transforms the blood of the organism into pus and proves fatal thereby. An injury to any of the *vayu*-carrying vessels, known as the *āpastambha marma* (carina) of the trachea) fills the thorax with the deranged *vāyu*, leading to cough, dyspepsia and death.[6]

Of the *marmas* present in the back, an injury to any of the *katika tarunas* (sacro-iliac articulations) situated in the region of the *śroni* (sacrum) on both sides of the spinal column, gives rise to an excessive haemorrhage and consequent pallor and death. An injury to any of the *kukundara marmas* (sacro-sciatic notch), situated on both sides of the spinal column, results in complete anaesthesia and loss of function of the lower extremities.

An injury to the *nitmva marmas* attached to the side above the *śroni* (pelvis) and inside to the muscles of the waists, causes *sosha* (atrophy) of the lower extremities. An injury to the *pārshva-sandhi-marma* (coelic axis) fills the abdomen with blood and results in death. An injury to the *vrihati marmas* which commencing from the roots of the breast, course round both sides of the spinal column (*prishta vamsha*) cause excessive bleeding and death. An injury to any of the two *amsa phalaka marmas*, situated on either side of the vertebral column and connected with the scapula causes anaesthesia or atrophy

of the arms. An injury to any of the two *amsa-marmas*, which are situated on either side midway between the neck and the top of the arms is attended with an incapacity to move the hands.[7]

Of the *marmas* present above the clavicles, an injury to any of the two *śirā-matrika marmas* consisting of four vessels on the two sides of the neck, causes death within a day. An injury to any of the two *krikātika marmas* lying at the junction of the head and neck (transverse process of the arch of the atlas) results in a free movement of the head. An injury to any of the *vidhura marmas* attached to the lower end of an ear results in loss of hearing. An injury to the *phana marmas* attached to the interior channels of both the nostrils, results in the loss of the faculty of smell. An injury to the *apānga marmas* situated below the tips of the eye-brows and about the external corners of the eyes (anastomosis of the infra-orbital artery) causes blindness or impaired vision.

An injury to the *śankha marmas* (suture of the temporal, frontal and sphenoid bones—pterion), situated over the tips of the eye-brows and between the ears and the forehead, results in death within the day. The *utkshepa marmas* situated over the two temples near the place where the hair end, when injured by the shaft of an arrow and that shaft is extracted, results in the death of the patient ; if, on the contrary, the shaft is allowed to remain inside or if the shaft comes out of its own accord (after putrefaction), the patient survives. An injury to the *staphani marma* (nasal arch of the frontal veins), situated in the middle of the eye-brows, ends in a manner similar to the preceding one.

An injury to any of the five joints of the head known as the *simanta marmas* results in madness. An injury to any of the four *sringataka marmas* which forms the junction of the four *śirās* and soothes the nose, the eyes, the ears and the tongue, proves fatal within the day. An injury to the *adhipati marmas* (the vertical groove on the frontal bone) which is marked on the inner side of the roof of the cranium by the *śira saṇnipāta* (superior longitudinal sinus) and on the external side by the ringlet of the hair (*romāvarta*), proves fatal within the day.[8]

The *Suśruta samhitā* gives precise measurements of the distances around the *marmas* within which a lancet should not be used. A major injury away from a *marma* is less dangerous than a minor

injury near or upon a *marma*.

It is on the basis of detailed knowledge of the *marmas*, tha the ancient Indian surgeons performed operations, some of whicl till modern times were considered nothing less than miracles.

General Body Anatomy

Indian physicians did not possess as good a knowledge ol general anatomy of the body as they did of the regional anatomy in the form of *marmas*. Yet they dissected human bodies, and tried to look into the body as much as was necessary for them.

They had their own peculiar but very efficient method of preparing the dead body for dissection. "The dead body should be complete and undamaged. It should not be of a person excessively old, or one died of poisoning or protracted disease. After removing the filthy contents of the intestines, the body should be deposited at a secure and hidden spot in a river, and allowed to decompose. After an interval of seven days, the thoroughly decomposed body should be taken out and very slowly, scrubbed with a whisk made of grass roots. At the same time, every part of the body, great or small, external or internal, beginning with the skin should be observed carefully as they become apparent in the course of scrubbing."[9]

The total number of bones in the human body, according to the *Charaka saṁhitā*, are 360. Some of the cartilages are also included as bones ; sometimes the parts of a bone are counted as separate bones and at other times a group of separate bones is counted as one bone. There are 32 teeth, 32 sockets of teeth, 20 nails, 60 phalanges, 20 long bones, 4 bases of the long bones, 2 heels, 4 ankle bones, 4 wrist bones, 4 bones of the forearms, 4 bones of the legs, 2 knees, 2 knee caps, 2 elbow-pans, 2 hollow bones of the arms, 2 shoulder blades, 2 collar bones, 2 hip bones, 1 pubic bone, 45 back bones, 14 bones of the breast, 24 ribs, 24 sockets of the ribs, 24 tubercles fitting into the sockets, 15 bones of the neck, 1 wind pipe, 2 palatal cavities, 1 lower jaw or chin, 2 basal tie bones of the jaw, 1 bone constituting the nose, prominences of the cheeks and brows, 2 temples, 4 cranial pan-shaped bones.[10]

According to the *Suśruta samhitā*, there are only 300 bones in the body. These are 120 bones of the four extremities being 30 in each of the four limbs. In the lower limb, there are 3 bones in each

toe, making a total of 15 ; in the sole of the foot and ankle there are 10, in the heel 1, in the lower leg 2, in the knee 1, in the thigh 1. In the pelvic cavity there are 5 bones ; of these there are 4 in the anus, pubes and hips, the fifth constitutes the triangular sacrum. There are 36 bones in each side (*pārśva*) ; 30 in the back, 8 in the chest, 2 collar bones. Above the clavicles, there are 9 bones in the neck, 4 in the wind-pipe, 2 in the jaws, 32 teeth, 3 bones in the nose, 1 in the palate, 1 in each ear, temple and cheek (total 6), and 6 bones of the cranium.[11]

While the knowledge of the bones of the human body is fairly good, that of the muscles is, however, only rudimentary. The *Charaka* speaks of muscles as masses of flesh only. The *Suśruta samhitā*, on the other hand, counts them as 500 and gives their distribution as well. The actual number, as we know now, is 513. This is very near to the *Suśruta* number, but if the muscles are counted region-wise, the discrepancy in the *Suśruta's* knowledge becomes clear and then we come to realise that its count may be near to the actual number just by chance.

Indian physicians did not study or knew much about the brain. Except for recognizing some of the cranial nerves and inferring their function on the basis of loss of function after injury, their knowledge in this field was negligible. It seems they were too hesitant to investigate this part of the body full of sensitive spots (*marmas*) which could not be studied in a living patient ; and according to them there was no use of knowledge that could not be applied in practice.

The subject of 'channels' and linear structures, be they *śirās*, *srotas*, *dhamanis* or *nādis*, has created a lot of confusion and controversy among modern medical men who have tried to read in them the concept of arteries, veins, nerves, etc. It must be admitted that ancient Indian physicians were ignorant of such concepts. Accord-to Āyurveda, there are several types of channels through which flow different body constituents. Free flow of the constituents in the channels signifies health, and obstructed flow, the disease.

For the lungs, the *Charaka* uses a singular word *kloma*. The *Suśruta*, in addition to the word *klomu*, uses another word *pupphusa*. Of the other internal organs, the stomach (*amāśaya*) is described as being situated above the receptacle of the *pitta*. It has a perforated anterior part and its interior is divisible in three parts. The intestine

(*pakvāśaya*) is divided into the small (*kashudrāntaram*) and large intestines (*stulāntram*). The lower end of the large intestine is called *gudam* (rectum) and this ends in *gudoushtha* (anus). The interior of the rectum is provided with three spiral grooves. These grooves or ring-like muscles lie a finger and a half apart from one another and are respectively known as *pravāhini*, *visarjani* and *samvarani* or the grooves, the outflow, defecation and closure of the anus, covering a space of four fingers and having laterally an elevation of one finger's width.[12]. The intestine of the adult male measures 14 cubits in length, while those of an adult female measures only 12 cubits.[13]

The urinary bladder shaped like a gourd is described as situated in the pelvic cavity, surrounded by the back, loin, umblicus, scrotum, rectum, groin and penis. It is provided with a single aperture or opening and lies with its mouth downwards, covered with nets of *śirās* and *snāyus*. It is connected through its mouth or external orifice with the rectum, the penis, and the testes. "The urinary ducts pass close by the large intestines and constantly replenish the bladder and keep it moist with the waste product of the system in the same manner as rivers carry their contributions of water into the ocean. These passages or ducts (which are two) are found to take their origin from hundreds of almost invisible branches which carry the urine from below the region of the stomach into the bladder keeping it flooded with this important fluid during the waking hours as well as sleep."[14]

The uterus (*garbhāśaya*) is described as being situated in the space bounded by the *pittaśaya* and *pakvāśaya*, adjacent to the urinary bladder.[15] The vagina resembles the navel of a conch shell in shape and possesses three involuted turns like the interior of a mollusc. The uterus is situated at the third posterior involuted turn.

Description of the rectum, the uterus, and the urinary bladder shows that the anatomy of the part of the body which came frequently under observation because of surgical operations was well known. The rectum came under observation for giving enema ; vagina, and uterus in cases of delivery, and the urinary bladder for the removal of stones.

Embryology

Indian physicians state certain views and record observations about the conception and development of the foetus in the uterus of

the mother. Their views on the subject of embryology have not stood the test of time ; on the other hand what they observed themselves and recorded is substantially correct.

If at the time of fertilization, the blood (*sonita*) of the mother predominates in the embryo, the result is a girl ; if the semen predominates, it is a boy ; a hermaphrodite is born when the semen and the blood are in equal measure or if the productive power of the semen has been burnt up. If the seed gets divided into two or more portions, then two or more children are born.[16]

If the conception occurs during the even days of menstrual cycle, a male child is born ; on odd days, it is female. The reason for this is the fact that the menstrual fluid flows less on even days, hence a male ; it is more on odd days, hence a female. As a corollary to that if a couple desires a son, they should have sexual intercourse on the 4th, 6th, 8th, 10th or 12th night, and for a daughter on the odd nights. Intercourse on the 13th and subsequent nights is deprecated. The fourth night after the start of the menstrual period in a woman is considered as the most auspicious for having intercourse. This, however, is contrary to modern scientific views which state that ovulation occurs between the 13th and 17th days after the start of menstruation, and accordingly on the fourth and many subsequent days till the ovulation occurs, the intercourse would be without conception.

The sex of the unborn child has excited the curiosity of all, at all times. Ancient Indian texts describe symptoms which could predict the sex before birth. The birth of a male child is predicted if the pregnant woman raises the right foot first while walking, if the right eye looks larger, if she evinces a longing for things with a masculine name, if her face becomes brighter, if the milk is first detected in the right breast. Desire for the company of females, bulging of the foetus on the right side of the abdomen, manly temper and actions also indicate a male child. Conditions opposite to the above indicate a female child. If the sides of the abdomen become raised and the forepart is found to bulge out, a sexless child is predicted. If the middle part of the abdomen is sunk or divided in the middle like a leather bag, twins may be expected.[17]

The *Charaka* and the *Suśruta* describe the gross development of the foetus during each month of pregnancy. These observations

must have been based on the aborted foetuses. During the first month after conception, the spirit becomes the embryo and it appears as a jelly-like mass of no particular shape. During the second month, this mass hardens into the form either of a knot, a tendon or an egg, of these, the knot-shaped is male, the tendon-shaped female and the egg-shaped an eunuch. During the third month, all the sense organs and all the limbs emerge simultaneously ; from this time onward the embryo is seen to throb ; the heart of the foetus is connected with the mother's own heart by the channels that carry nourishment. At this time the foetus yearns for this or that thing and such yearnings are conveyed by these channels. Such yearnings of the foetus conveyed through the mother should be fulfilled as far as possible.

During the fourth month, the foetus becomes stabilised and the woman shows a pronounced increase in body weight. In the fifth month, there is a greater increase in the weight of the foetus compared with the other months ; hence, at this time, the mother becomes exceedingly emaciated. In the sixth month, the foetus acquires strength and pigmentation ; consequently, at this time, the pregnant woman loses strength and colour. In the seventh month, the foetus develops in every possible way ; therefore, at this time, the pregnant woman becomes exceedingly restless. In the eighth month, on account of the yet incomplete formation of the foetus, there is a continuous transmission of vitality from the mother to the foetus and vice versa by means of the channels that carry the body nutrient fluid. Therefore, at this time the pregnant woman becomes moody and so does the foetus. The birth of the foetus in this month is risky because of the instability of the vital essence. It is on account of this consideration that the learned say that the eighth month needs all the care and attention.[18]

Suśruta's observations in respect of the development of the foetus in different months are substantially the same as those of *Charaka.* In certain respects the *Charaka* is more elaborate. Thus *Suśruta* says that in the first month the foetus has a jelly-like form (*kalala*). In the second month the material constituents of the body, having undergone a chemical change due to the action of cold, heat and air, the foetus becomes hard (*ghana*) ; if it is the foetus of a male child, it is spherical (*pinda*) ; if a female, it is elliptical (*peśi*) ; if it is of a hermaphrodite, it is like the half of a solid sphere (*arbuda*). In

the third month five special eminences are seen, as also a slight differentiation of the limbs. In the fourth month the differentiation of the limbs is much more definite and well-manifested ; owing to the action of the heart, consciousness also comes into existence, since the heart is the special seat of consciousness. In the fifth month the consciousness becomes more awakened. In the sixth month intelligence begins to develop. In the seventh month the division and differentiation of limbs becomes complete. In the eighth month the vital element (*ojas*) still remains unsettled, so if a child is born at this time, it is short-lived.[19]

Views similar to those of the *Charaka* and *Suśruta* have also been expressed by Vāgbhatta, Vishnudhara, and the *Agni Purāna*.[20]

In connection with the gradual development of the embryo, *Suśruta* (and others as well) express the view that the growth of the embryo takes place by the process of stratification in which several layers are superimposed one upon another. This stratification commences with the skin and is brought about by the action of cold, heat and air. Seven different layers (*kālās*) of the skin are formed and deposited on the rapidly transforming product of the combination of *śukra* and *śonita*, in the same manner as layers of cream are formed and deposited on the surface of boiling milk. Besides these seven layers of skin, there are seven layers (*kālas*) between the different *dhātus*. These *kālas* are supposed to separate one layer of *dhātu* from another. In the first *kāla*, known as *mamsadhāra*, the vessels and tissues of the flesh are found. In the second, the *rakta-dhāra*, is found the blood inside the flesh. In the third called *medodhāra*, there is the fat which is found in the abdomen and also between the smaller bones. The fourth *kāla*, is the *ślesmadhāra* which exists in the joints. The fifth is the *purishtāra* which exists in the intestines and separates the excreta. The sixth and the seventh are the *pittadhāra* and the *śukradhāra*.[21]

Different organs of the body are formed from the blood ; some out of its essential and others out of its non-essential parts, by the action of heat of the *pitta*. The spleen and the liver are formed out of the blood ; the lungs are formed out of the froth of the blood ; and the *unduka* (faecal receptacle) from the dirk (*mala*) of the blood. The intestines, bladder and rectum are formed out of the essence of blood and *kapha*. The kidneys are formed out of the essence of blood and

fat. The testes are formed out of the essence of blood, flesh, *kapha* and fat. The heart is formed out of the essence of blood and *kapha*.

Parts of the foetus that are derived from the mother are skin, blood, flesh, fat, navel, heart, lungs, liver, spleen, breasts, pelvis, stomach, intestines and marrow. Those that are derived from the father are hair of the head, nails, teeth, bones, nerves, sinews, arteries and semen.

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2. *S.S.*, 3. 6.4.
3. *S.S.*, 3. 6. 16-21
4. *S.S.*, 3. 6. 23.
5. *S.S.*, 3. 6. 32-37.
6. *S.S.*, 3.6. 47-56.
7. *S.S.*, 3. 6. 57-64.
8. *S.S.*, 3. 6. 65-80
9. *S.S.*, 3. 5. 50-56.
10. *C.S.*, 4. 7. 4-7 ; also *Medicine in Ancient India by* A.F. Hoernle, p.22.
11. *S.S.*, 3. 5. 17-20 ; also Hoernle, A.F. op. cit., pp. 86-87.
12. *S.S.*, 2. 2. 4.
13. *S.S.*, 3. 5. 8.
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15. *S.S.*, 3. 5. 43.
16. *C.S.*, 4. 3. 11-12.
17. *S.S.*, 3. 3. 20, *C.S.* 4. 2. 23-24.
18. *C.S.*, 4. 4. 9-24.
19. *S.S.*, 3. 3. 14-16.
20. Misra, B.B., Human Anatomy According to *Agni Purāna*. *I.J.H.Sc.*, 5. 1. 101.
21. *S.S.*, 5. 4. 26.

categories is substance (*dravvya*), which can be subdivided into nine entities, five of which are earth (*kshiti*), water (*apa*), fire (*teja*), air (*vāyu*) and ether (*ākāśa*).

It is these five types of substances which supplied the *puncha-bhuta* concept of matter. This forms the basis of the Indian medical system.

The Vaiśeṣika philosophy describes the manner in which combinations of different types of *pramānus* occur producing the various substances that we see around us. This combination of *pramānus* may be simple addition, or it may be, that under the influence of *teja*, a *pāka* (chemical reaction) takes place, producing substances having qualities different from those of the uniting constituents.

This *pāka* reaction provided the basis for the concept of digestion and metabolism of food and its conversion into *dhatus* and *doṣas* of the body, upon which was built the theory of *tridoṣa* of Āyurveda. It also provided the basis of the science of dietetics, i.e., what sort of diet should be taken in a particular disease or in a normal state by a person of a particular constitution.

Thus we see that the contribution of Vaiśeṣika to the systematization and development of Āyurvedic medicine is fundamental.

Another sage of almost the same period was Gotama Akshapāda who besides his other contributions, systematized all knowledge that was needed in order to establish the identity of a fact or substance. This knowledge is contained in the *Nyāya sūtra* composed by him.

The *Nyāya sūtras* begin by enunciating the significance of knowing the contents of the text. It says : "Supreme felicity is attained by the knowledge about the true nature of the sixteen categories, viz., means of right knowledge (*pramāna*), object of right knowledge (*prameya*), doubt (*samśaya*), purpose (*prayojana*), familiar instance (*driśtānta*), established tenet (*siddhānata*), members (*avayava*), confutation (*tarka*), ascertainment (*nirnaya*), discussion (*vāda*), wrangling (*jalpa*), cavil (*vitāndā*), fallacy (*hetva-bhāśa*), quibble (*chhala*), futility (*jati*) and occasion for rebuke (*nigrasthāna*).[1]

According to Nyāya, there are four methods of establishing the true identity of a fact, a phenomenon or an object. They are : perception (*pratyāksha*), inference (*anumāna*), comparison (upāmana) and testimony (aptavākya).



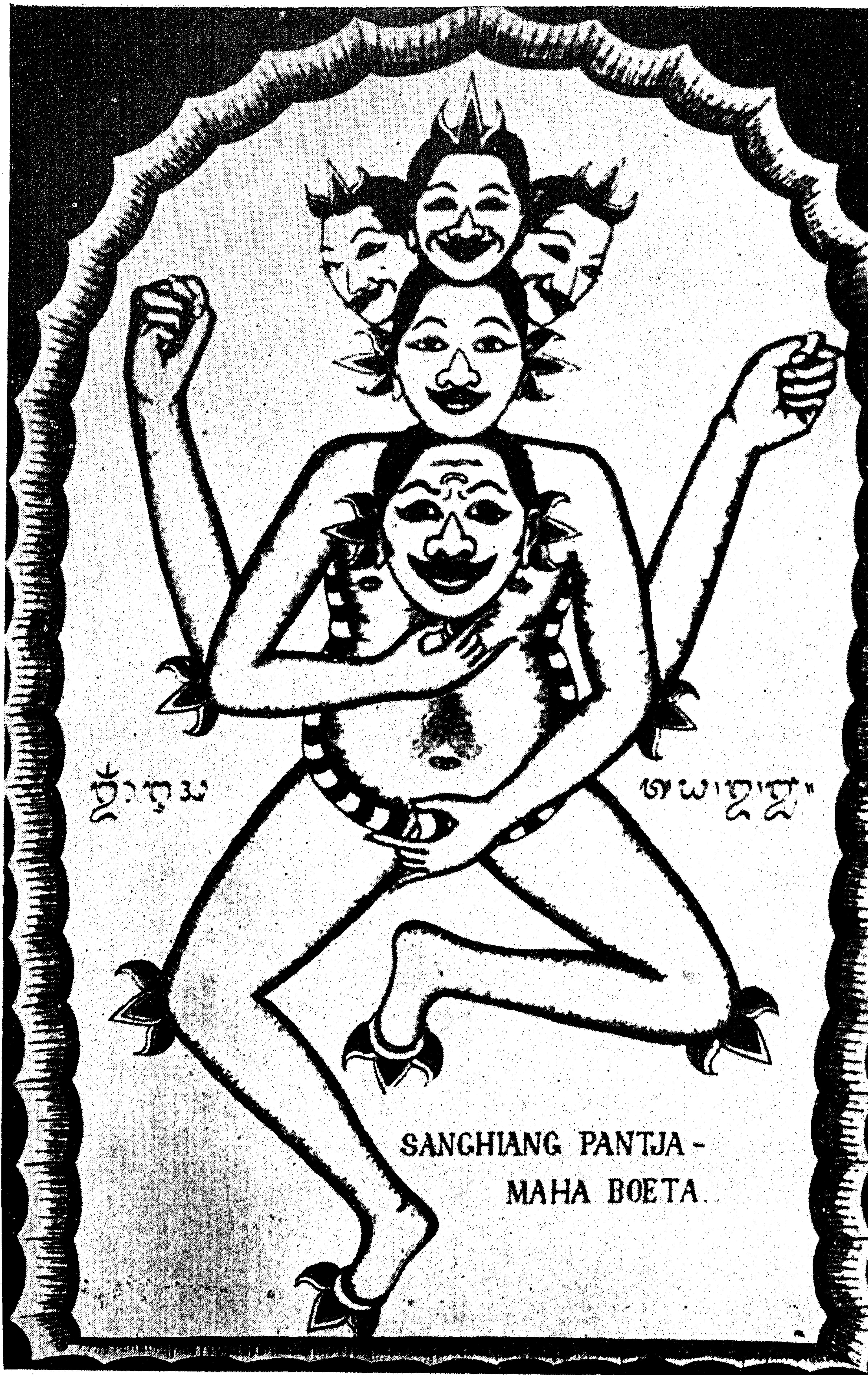
22. Delivery (Hangal).



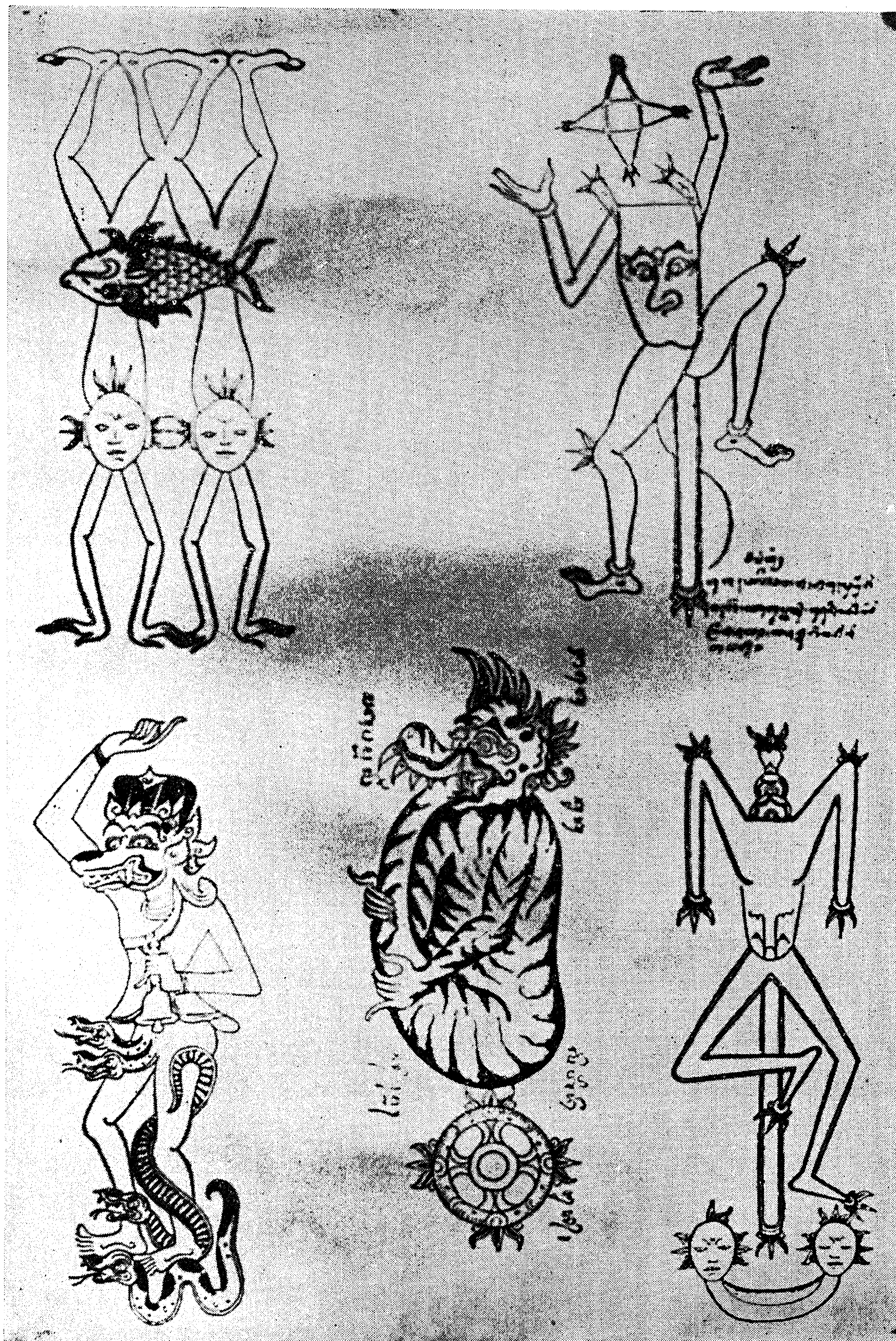
23. Birth of an Elephant (Siva Temple, Tanjore).



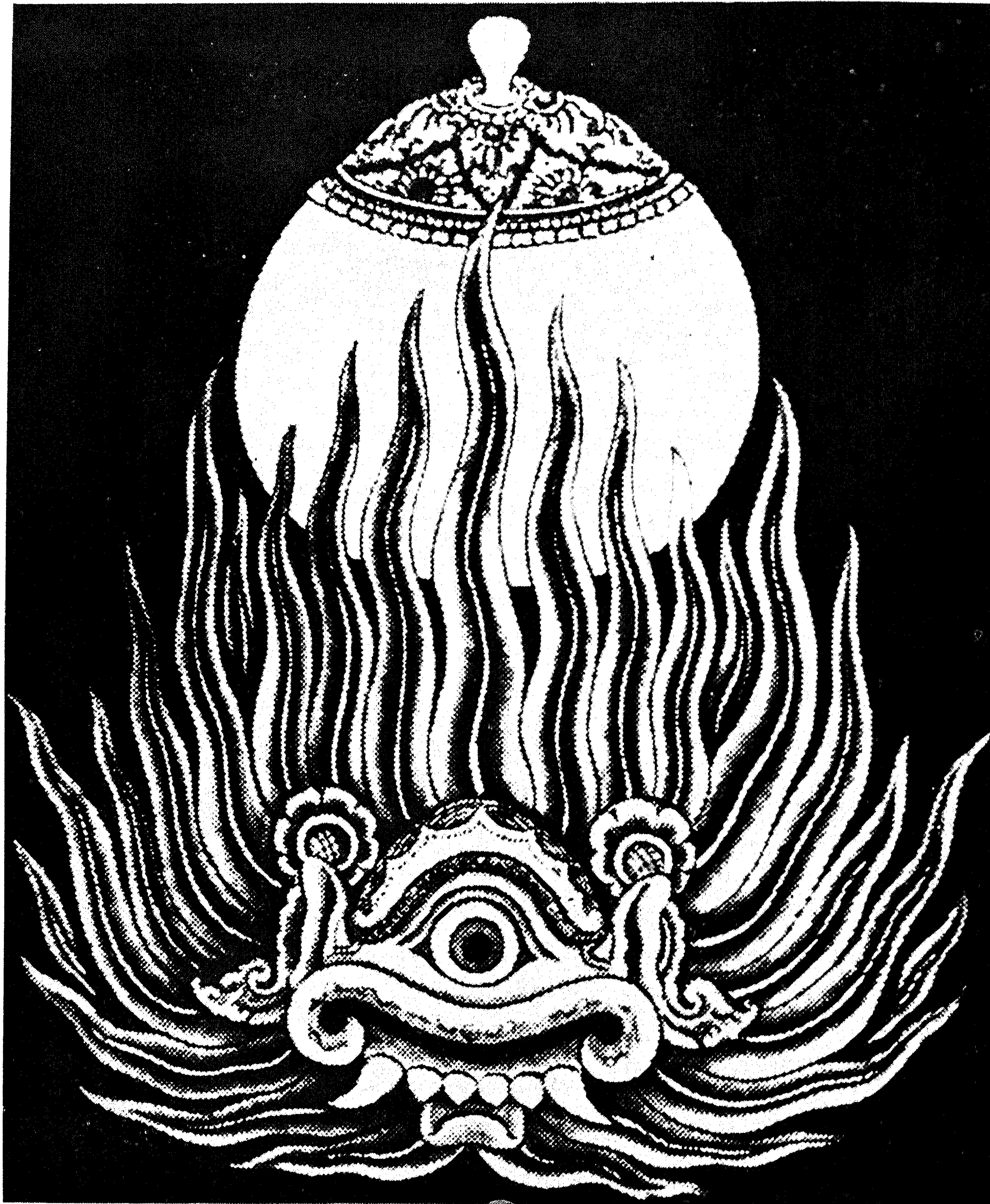
26. Restoration of Nose by Plastic Surgery.



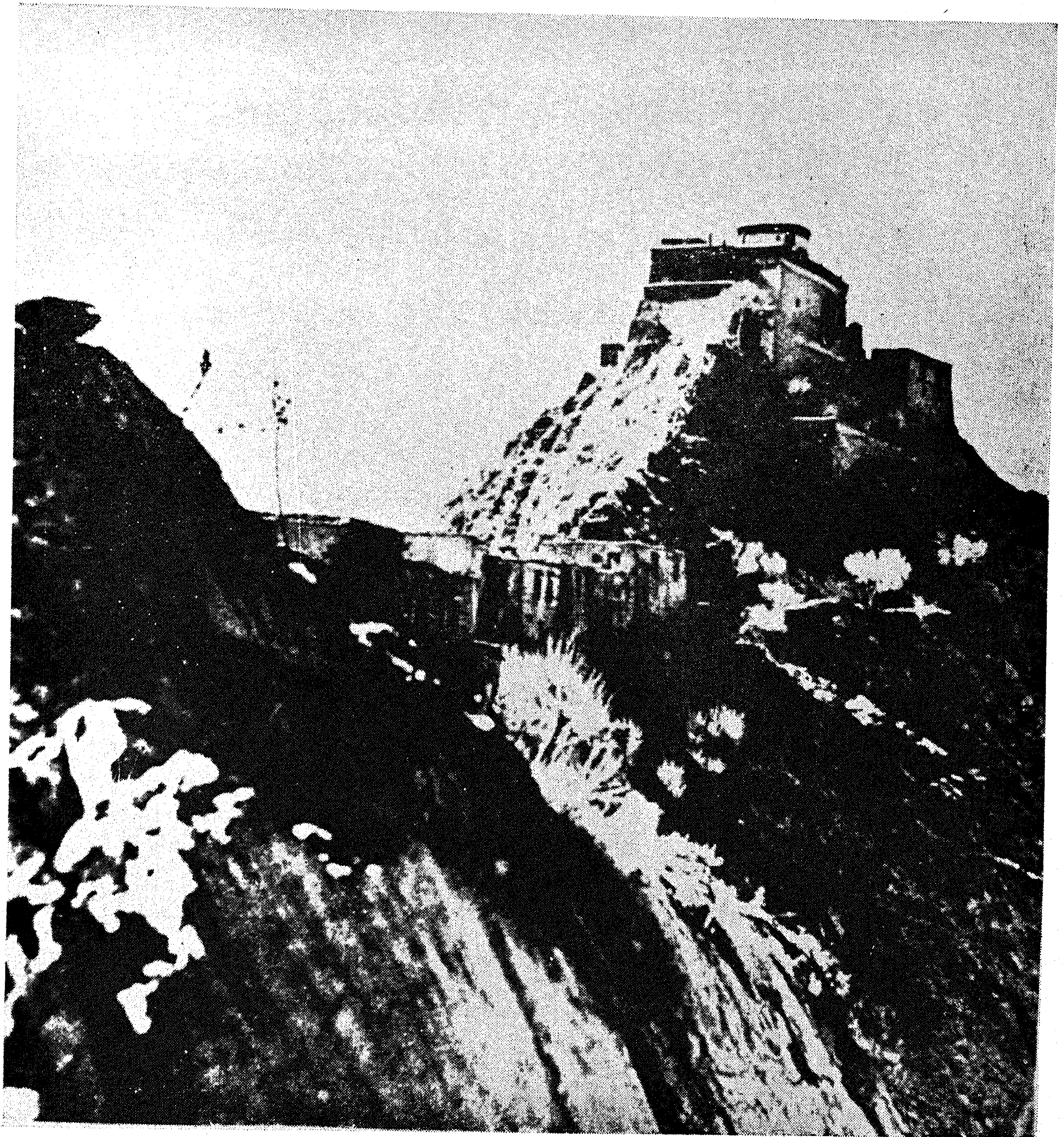
28. Pancha-maha-bhuta, Ancient Tibetan Depiction.



33. Ancient Tibetan Depiction of Different Diseases.



34. Somatocosmic Symbol of Ayurvedic Medicine in the fan-shaped Bali Island of Indonesia.



37. Old Medical School at Lhasa, Tibet.

These four methods of Nyāya based on the physical experience of things, have been made use of extensively in the study of the action of various drugs included in Indian pharmacopoeia. These methods have been discussed in detail in another chapter in this book. Suffice it to say here that the contribution of the Nyāya system of philosophy to Āyurvedic medicine in establishing scientific methodology is as great as the contribution of the Vaiśeṣika to Āyurveda.

The Nyāya category of *parmeya*, the things to be known, covers the things categorized by the Vaiśeṣika, and the latter discusses perception, inference and verbal testimony in its text. It is not surprising then to find the two schools becoming, to all intents and purposes, one around the eleventh century A.D.

The contribution of the Sāmkhya philosophy to the fundamental basis of Āyurvedic medicine is no less significant than that of the Nyāya and the Vaiśeṣika ; its basic tenets are woven in different forms around Āyurvedic medicine.

According to the Sāmkhya theory expounded by Kapila around the sixth century B.C., the universe evolved out of an unmanifested, undifferentiated, infinite and eternal primordial ground termed *prākriti*. This is made up of three basic entities called *gunas*. These, in turn, are again indeterminate and incapable of independent existence, but possess certain characteristic properties. The first *guna*, *tamas* or matter, has the property of inertia. The second *rajas* or energy, has the property of overcoming resistance. The third *sattva* or essence, has the property to manifest itself to the senses. All these *gunas* exist in uniform diffusion and equilibrium in *prākriti*. The tendency of energy to do work is counteracted by the inertia of matter and so the essential nature of *prākriti* is maintained.

According to the Sāmkhya, properties of a thing are due to the energies that are manifested in a particular collocation of the three *gunas*, i.e., the mass, energy and essence. The two substances of the same *bhūta* class differ from one another because of the different groupings or the quanta of *tanmatras* in their infra-atomic structure.

In the Vaiśeṣika (and also in the Nyāya), on the other hand, atoms of the same *bhūta* class are alike in themselves and homogeneous. The variety of substances comprehended under the same *bhūta* is ascribed merely to the different arrangements or groupings of the

atoms and not to their components.

Some of the terms used in these systems of philosophy have been modified in Āyurvedic treatises. This has been done to meet the requirement of the system and to fit in their concept properly and understandably.

It is to the influence of these schools of philosophy that medicine is indebted for the impetus which led medical men to gradually substitute the concept of physical causation for the spiritual agencies of animism, which formed the prior Vedic attitude towards nature.

Physiology of the Body

Observations about food, its digestion and metabolism, and the formation of body constituents out of it, are contained in ancient Indian medical texts. Some of these observations are remarkably correct, and the explanations and theories put forward to explain the phenomena are very coherent. They look far more advanced when compared with the theories put forward by other contemporary systems of medicine in other parts of the world. These theories, based as they are on gross observation, have, however, now been surpassed by the modern theories on the same subject.

Food, its Digestion and Metabolism. The food that we take is composed ultimately of the five elements (*bhūtas*) viz., *prithvi* (earth), *apa* (water), *teja* (fire), *vāyu* (air) and *ākāśa* (ether). Different combinations of these five *bhūtas* confer upon different foods different qualities. One of the most important of such qualities is that of *rasa* (taste) which may be any one of the six, *i.e.*, sweet, sour, saline, pungent, bitter and astringent, or a combination of them. All the five *bhūtas* go to make any one *rasa*, but in different *rasas* different elements predominate and it is this predominance of one or more *bhūtas* in a substance which gives it a characteristic taste. Thus with the predominance of water, there is a sweet taste ; with the predominance of earth and fire, an acid taste ; with water and fire, a saline taste ; with air and fire, a hot and pungent taste ; with air and *ākāśa* a bitter taste ; with air and earth, an astringent taste.

Each of these *rasas* is capable of producing certain physiological effects. The sweet (*madhura*) taste is said to increase blood, flesh, fat, marrow, semen and life ; it helps the six senses ; it is moist, cold

and heavy. The acid (*amla*) taste is said to rouse digestion, develop the body, and remove *vāta* ; it is light, warm and moist. The saline (*lavana*) taste is digestive ; it removes *vāta*, secretes *kapha* and is moist and warm. The pungent taste (*katu*) provokes digestive fire ; it is light, warm and dry. The bitter (*tikta*) taste promotes the appetite, it assists digestion of the undigested food and removes harmful *doṣas*, etc ; it is dry, cool, and light. The astringent (*kāsaya*) taste restores harmony among the *doṣas* ; it is dry, cool and heavy.[2]

The *rasa* (taste) of some substances changes altogether after digestion and in such cases the taste into which it changes after digestion (*pāka*) is what matters. This theory of *rasas* plays an important part in the Indian System of Medicine as it dictates the selection of medicines and diet.

In addition to the *rasa* qualities, different foods are considered to possess other qualities, such as the ten pairs of opposite qualities : heavy and light, cold and hot, oily and dry, mild and keen, compact and mobile, soft and hard, clean and slimy, smooth and rough, minute and gross, solid and liquid.[3] The most important pair of these is of heavy and light qualities. Light food contains largely the properties of *vāyu* and *teja*, while those called heavy contain largely the properties of *prithvi* and *apa*. For this reason, all kinds of light food are, in consequence of their natural properties, endowed with the capacity of enhancing the digestive fire and are said to be less injurious even when taken to satiety. All kinds of heavy food, on the other hand, in consequence of their dissimilarity, are incapable of prompting the digestive fire ; hence they become injurious when taken to satiety.[4] Each *rasa* is listed as heavy or light ; in the order of heaviness, the sweet taste comes first, the astringent in the middle and the bitter comes last. In lightness, the bitter taste comes first, the pungent in the middle and sour comes the last.[5]

Like the food, the human body is also composed of the same five *bhūtas* which get modified in the body into seven different entities called *dhātus*. *Dhātus* are the entities that enter into the formation of the basic structure of the body. These *dhātus* are *rasa* (chyle), *rakta* (blood), *mamsa* (flesh), *medas* (fat), *asthi* (bones), *mājja* (marrow) and *śukra* (semen).

When we take the food, *prāna vāyu* gets hold of it and sends it down the stomach. Here the solid food is dissolved and softened

by the liquid juices and the oily matter. After some time, with the help of *samāna vāyu*, a digestive fire is set up to digest the food properly.

In this process of digestion, initially the six *rasas* (tastes) contained in the food begin to be digested, a sweet reaction sets in, and foamy *kapha* appears. Later when the food is half digested, a second type of reaction which is sour sets in, and the digested food now passes into the small intestine ; a liquid substance called *pitta* appears in it. When at last what is left of the food reaches the large intestines, it begins to dry up and is converted into a dry mass. During this process, a third type of reaction sets in which is bitter and astringent ; *vāta* appears at this time.

After the food has been thoroughly digested, a fine liquid substance full of energy is produced from it. This is called *āhāra rasa.*

From the large intestine (*pākvāśaya*) where this *āhāra rasa* is produced, it is driven by *prāna vāyu* through vessels (*dhamani*) to the heart which is called the seat of *rasa dhātu.* From here it is carried by eight *dhamanis* to different parts of the body—two to the upper part of the body, two to the lower part, and two each laterally. On its way it goes to the liver and spleen also.[6]

It is from this *āhāra rasa* that the different *dhātus* of the body are produced. From the *rāsa* is first produced *rasa dhātu* ; from *rasa dhātu,* blood ; from blood, flesh ; from flesh, fat ; from fat, bones ; from bones, marrow ; from marrow, the semen ; and from semen, the *ojas.* According to the *Suśruta, ojas* is produced not only from the semen but from all the *dhātus.*

The *dhātus* remain in the body in the particular proportion and any change in their proportion or equilibrium, causes disease.

How the successive *dhātu* is produced from the previous one, is explained by the *Suśruta* by an analogy called *kedari-kulyānayayā* (irrigation channel analogy). According to it, from the heart *āhārā rasa* is carried by means of various *dhamanis* to different *dhātus* of which the body is composed. By this analogy, heart is the tank, *āhāra rasa* is the water, *dhamanis* the water channels, plots of fields the *dhātus.* Just as the plots in the field take whatever they want from the channels through which the water flows and pass on what is not needed towards the next plot, so also the *dhātus* take from the

dhamanis, through which flows the *āhāra rasa*, whatever they want and pass on the rest to the next *dhātu*. All the water carried by the channels is utilized for the irrigation of the field and no water returns to the tank ; the tank is filled either by rain or by a spring. Similarly *āhāra rasa* carried through the *dhamanis* is utilized by the *dhātus* and no *āhāra rasa* returns to the heart. The heart is filled again and again by fresh *āhāra rasa* manufactured from the food that is digested.[7]

This transformation of the *āhāra rasa* into different *dhātus* is brought about by a process of cooking (*pāka*) for which five *bhūtāgnis* and the seven *dhātvāgnis* are responsible. The food consisting of the five *bhūtas* is first digested by the internal heat (the digestive fire) and subsequently by the fine elemental heats or fires (*bhūtāgnis*) in turn and each of its constituent element goes to augment its own allied *bhūta* in the body. The *dhātus*, viz., of *rasa, rakta, mamsa, meda, asthi, mājja* and *śukra* are cooked by their respective fire.

The concept of *agni* in Āyurveda is very important and significant. The *pitta*, five kinds of *bhūtāgnis* and seven kinds of *dhātvāgnis* perform the function of digestion and metabolism of the food that we take.

Some further details involved in the process of this transformation of the *āhāra rasa* into different *dhātus* successively, have been explained by later writers or commentators.

Chakrapāni, the commentator of both the *Charaka* and the *Suśruta*, gives details of this process of cooking (*pāka*) of the *dhātus* as follows : It says : In this process, each *dhātu* gives off a finer essence (*sukshma bhāga*) which serves as the material for the next succeeding *dhātu* and a dross (*mala*) which forms the source of the excreta in the body (including the nails, the hair etc.), besides retaining its own substance (the gross or the main part) which is driven by the *vāyus* or the *śrotas* to its destination in the body.

According to Seal, the essence of *rasa* (*sukshma-bhāga*) from the small intestines is driven by the *prāna vāyu* along a main trunk, first to the heart (which is a great receptacle of *rasa*) and thence to the liver and spleen; and in the liver the colouring substance in the bile acts on the essence of *rasa*, especially on the *tejas* substance therein and imparts to it a red pigment, transforming it into blood; but the grosser part of the *rasa* (*sthula bhāga*) proceeds along the *dhamānis*,

driven by the *vyana vāyu* all over the body. When the blood has been formed, the essence of *rasa,* in the blood, acted on by *vāyu* and *mamsāgni* (the flesh-forming fire) forms the flesh tissue, the earthy part of the food substance specially contributing to this tissue.

Of the flesh tissue thus formed, the grosser part goes to feed or replenish the flesh tissue all over the body. The finer essence of flesh in the blood, in the *rasa*, acted on again by *vāyu* and the fat-forming fire in the menstruum of (*rasa*) receives viscosity and whiteness, and produce the fatty tissue, the earthy and watery parts of the food specially contributing to the product. The fat in the *rasa* (or blood) or rather the grosser part of it replenishes the fatty tissue of the body, but the finer essence of fat in the flesh, blood and *rasa* acted on by *vāyu* and the marrow-forming fire, in the menstruum of *rasa* becomes hard or crystalline, and forms ; the earthy, airy and the fiery parts of the food contributing principally to the product. The essence of the fat fills the hollow channels of the bones, and acted on by *vāyu* and marrow-forming fire becomes transformed into marrow. The marrow is similarly transformed in semen. The semen or rather all the elements in their finer essence, give off *ojās*, which returns to the heart, the receptacle of the *rasa* and blood, and again floods the body and sustains the tissues, thus completing the cycle.[8]

It is to be noted that throughout the *āhāra rasa* acts as the mother substance and that each constituent of the body (*dhātu*) takes up the proper elements (*bhūtas*) from the *āhāra rasa* to form the next body constituent. Throughout the transformation of the finer essence of the preceding *dhātus* into the succeeding body constituent (*dhātu*) is brought about by its respective *dhātvāgni.*

The ancient Indian views on digestion and the metabolism of food can be compared with those of the ancient Greeks. In one of the books of the *Corpus Hippocraticum* (B.C. 426) entitled *Ancient Medicine*, the author says : "The fundamental principle of life is the inherent warmth of the body which has its seat in the left heart. Under the influence of this warmth, elementary fluids of the body are formed from food and from variable admixture of these fluids, solid parts of the body are formed. The diversity of organs is explained by different degrees of influence exercised by the warmth upon the primary matter. Blood, produced in the liver, is the chief material from which the organs are built up."

Aristotle on the same topic expresses himself more elaborately. He says : "The food masticated in the mouth but not otherwise altered, reaches the stomach where it is concocted ; the heat for this purpose, which is not common heat but a heat with special powers, is supplied by the liver and spleen, which are not organs in close contiguity with the stomach.

"The solid and indigestible portion passes off by the lower bowel, but the fluid portion which alone can partake in nutrition is absorbed by the blood vessels of the stomach and the intestines. The matter thus absorbed passes up to the heart in the form of vapour, not yet being blood but only an imperfect serum. In the heart and vessels, it undergoes a second concoction and the serum is converted into blood. The blood, when made, passes from the heart by vessels, being mingled with air inhaled by the lungs and thence conveyed to the heart, and is carried to all parts of the body. Each organ selects from the common stock those materials which it requires. The nobler parts such as the flesh and the organs of sense, take the choicest elements, while the inferior elements or the leavings of the former.

"Thus every part of the blood that can be turned into account is utilized; but such of it as is unfit for use, for instance, any bitter substance, is excreted as bile, urine, sweat etc. in company with the matter which results from the decay of the parts themselves. Such surplus of nutritious matter, as there may be after all parts are satisfied, is either stored up in the body as fat or the like or passes out to form hair, scales, feathers and other cutaneous appendages."

Blood. Blood, according to the Indian System of Medicine, is one of the *dhātus* of the body derived from *rasa dhātu.* It gets its colour in the liver and the spleen by the action of *ranjakāgni,* a type of *pitta.*[9] Normally it strengthens the other *dhātus,* improves the complexion, aids the organs of touch in the proper performance of their functions. Blood is life; it maintains vitality.

The heart is the chief receptacle of the three most important fluids of the body, one of which is *rakta,* the other two being *rasa* and the *ojas.* From the liver, it is carried by ten *śiras* which divide into 175 and distribute it to all parts of the body. From the heart, it is carried by four *dhamanis,* two to the upper part of the body and two to the lower part of the body.

Reproduction. The course of transformation of the *āhāra rasa* to

the *dhātu* (semen—*śukra*) in men takes about a lunar month's time; in women during the same period is produced the menstrual blood. As butter is contained in milk, and molasses in sugar-cane, likewise semen is found in the organism of man. As long as man is not excited, the seed exists all through the body. Infinitesimally subtle, the semen pervades the whole organism, expanding through it, like sound, light or water. The drugs meant to increase virility act in the manner of the purgatives : they expel the semen forcibly.

With women, the channels of the vessels carrying the menstrual blood, after conception, become obstructed by the foetus. Hence, in pregnant women there is no menstrual discharge. Obstructed below, the blood moves upwards and accumulates and is called the after-birth. Part of it goes still further upwards and reaches the breasts; hence the breasts of pregnant women grow large.[10]

The concept that semen is derived from all parts of the male body is also found in ancient Greek medicine.

Urine. About the formation of urine, the *Suśruta* states : "The urinary ducts constantly replenish the bladder and keep it moist with that waste product of the system in the same manner as rivers carry their contributions of water to the ocean. These ducts are found to take their origin from hundreds of branches which are not visible to the naked eye on account of their extremely attenuated structure, and carry, whether in the state of sleep or waking, the urine from below the region of the stomach into the bladder keeping it filled with this important fluid of the body, just as a new pitcher immersed upto its neck in a vessel full of water is filled by transudation through its lateral pores." As to the function of urine, it states, "the urine fills the bladder and removes the impurities of the body."

Tridosa Doctrine

We have already seen that after the digestion of food, it gets converted into *āhāra rasa* from which are successively produced seven *dhātus.* These act as *prasādas* which sustain and build the body. Another group of products produced during digestion and metabolism of food is *doṣas* which are three in number, viz., *vātta*, *pitta* and *kapha*. It is these *doṣas*, according to Āyurveda, which primarily govern the bodily activities, physiological as well as pathological.

The three *doṣas* are formed out of the five *bhūtas*, but each one

has predominant effect of one *bhūta*, so that each one is different in its composition, function and behaviour. The *doṣas* pervade the whole body, but each one has preference for location in a particular part or organ of the body. Each of three *doṣas* has five different aspects of function and behaviour.

The different aspects of the working of these *doṣas* in the body, constitutes the *tridoṣa* doctrine, and it is fundamental to all aspects of Āyurveda. As the three *doṣas* are so important in the causation of disease, its pathology, diagnosis and classification, we shall take up each *doṣa* individually and study them in detail.

The *kapha* (*ślesmā*, *balaśa*), according to the *Suśruta*, has its origin and principal abode in the stomach. It is mild and cool, white and heavy, sticky and slippery. It imparts moisture. Its taste is sweet, when not burnt by the internal heat of the digestive fire; when subjected to excessive heat, it turns salty. It is of watery consistency.

Originating in the stomach, *kapha* spreads throughout the body and maintains it through its moistening effect. Its energy is particularly active at five places, supplied from the main centre in the stomach. *Kledaka*, in stomach, moistens food and other places of *kapha* in the body; if deranged it produces indigestion, loss of appetite, whiteness of faeces, urine, etc. *Avalambaka*, in the heart, causes firmness of the limbs; if deranged it produces sloth. *Bodhaka*, in tongue, brings about taste; if deranged, it affects the sense of taste. *Tarpaka*, in head, oils and refreshes all the sense organs. If deranged it produces loss of memory and vitiates the senses. *Ślesaka*, in the joints, makes the joints flexible; if deranged it produces heaviness of the joints.[11]

The *pitta* has its principal abode in the region between the stomach and the large intestine. It is hot and fiery, wet and fetid. Its colour is dark-blue and yellow and it has an acrid flavour. It is the only substance in the body which contains heat. All parts of the body showing warmth are pervaded by *pitta*.

There are five places where *pitta* is especially active. Between the stomach and the intestines, *pāchaka*, causes the digestion and secretion of chyle, urine and excreta ; by its derangement, there is indigestion, acidity, burning sensation in the heart, throat and stomach. *Pitta* residing in the liver and spleen, called *ranjaka*, imparts characteristic red fiery color to the substance of chyle, which

is at first colourless when extracted by the cooking process ; hence, *pitta* in both these organs is called the 'reddening' fire (*ranjaka*) ; and chyle, reaching its first stage of transmutation, is in this way turned into blood. *Pitta* abiding in the heart is the fire which affects desires and longings ; hence it is called the 'effective' fire (*sādhaka*). In the eyes, as the fiery energy which seizes upon the colours and shapes of the sense objects, *pitta* is called the 'beholding' fire (*ālochaka*).

Pervading the skin, *pitta* acts as the irradiating fire (*bhrājaka*) ; its heat manifests itself in the warmth of the body ; it anoints and lubricates the skin, giving it, its lustre and complexion.

The *vāyu* is dry, light, cool and possessed of motion. The functions of *vāyu*, when it is in its normal state, are : energy in respect of action and movements, inhalation and exhalation of breath, the proper functions of the equable course of the several elements of the body and the equable or proper discharge of excreta and urine and such other impurities are escape or are secreted by the body.[12]

Symptoms of the abnormal functioning of *vāyu* are : tendency to fall, cheerlessness, thirst, tremors, pain in the whole body, piercing pains as if caused by needles, painful sensations as if caused by the limb being tightly bound with cords, twitching, roughness of the skin, hardness and heaviness of the limbs, loss of activity, redness of complexion, astringent taste in the mouth, contractions of the skin, muscles, nerves etc., and numbness or paralysis of the limbs.[13]

The seats of *vāyu* are the urinary bladder, the intestines, the pelvis, the two thighs, the two legs and the bones. Of these, the intestines (*pakvāśaya*) are the special seat of *vāyu*.

The five kinds of *vāyu* are : (1) *udāna*, in the throat, goes upwards and produces speech, music etc. ; its derangement causes diseases which have their place above the collar bone (in the throat and the head) ; (2) *prāna*, in the heart, causes inward breath and leads food inside ; by its derangement hiccup, asthma and similar diseases occur , (3) *sāmana*, in the stomach and the intestines, digests the food by the digestive fire and disintegrates it into its elements : *rasa*, excreta, urine etc. ; if deranged, it causes weakness of digestion, diarrhoea, and swelling of the body ; (4) *apāna*, in the lower body, propels the faeces, urine, sperm, menstrual blood and the foetus ; if

deranged it causes diseases of the bladder, anus, and diabetes; (5) *vyāna*, in the whole body, causes division of the fluids, the flow of sweat and blood, and the moving, opening and closing of the eyes etc.

The *Suśruta* counts blood, among the other three *doṣas*. "These three *doṣas*, *vāta*, *pitta* and *kapha*, in combination with a fourth, the principle of blood (according to the *Suśruta samhitā*), determines the origin, preservation and dissolution of animated organism and permeate it with their respective properties till the moment of death."[14]

Constitutional peculiarities of a person are also attributed to the preponderance or otherwise of the different *doṣas* in him at the time of his conception. Some men from the time to their conception in the mother's womb,, have an equilibrium or harmony of *vāyu*, *pitta* and *kapha*; some are seen in whom *vāta* predominates; some in whom *pitta* predominates: some in whom *kapha* predominates. Those in whom there is an equilibrium of the *doṣas* are always healthy while those in whom any one of these *doṣas* predominates, are subject to disease.[15]

The *Suśruta* compares the action of *vāyu*, *pitta* and *kapha* to that of air, sun and moon; "As the sun, moon and air maintain the earth by imparting, taking away, and diffusing power, so the three *doṣas* maintain the body by analogous action".[16] Thus the *Suśruta* considers *vāyu*, *pitta* and *kapha* as the three microcosmic representatives of the three divine universal forces: air, sun and moon respectively.

Some authors after Charaka and Suśruta compared the three *doṣas* with the three *gunas* of the Sāmkhya system. Vāgbhata in *Aśtanga Samgraha* develops this idea further. He said: As the three *gunas* co-operate together for the production of the world in all its diversity in spite of the mutual opposition that exists among themselves, so the three *doṣas* also co-operate together in spite of their natural opposition, for the production of diverse diseases.[17] Dhalana identified *vāyu* with *rajas*, *pitta* with *sattva* and *kapha* with *tamas*.

As seen already, the beginnings of the *tridoṣa* doctrine go back in time to the Vedic period. In the *Atharvaveda*, diseases are referred to as those produced by water (*abhāraja*), those produced by air

(*vātaja*), and those by fire or those which are dry or burning (*suśmaḥ*).[18] The *Charaka* and the *Suśruta* replaced water, air and fire with the *kapha, vāyu* and *pitta.* Since the time of Āyurvedic *saṃhitās,* it has been modified and interpreted in different ways by different authors or commentators.

Causation of Disease

Three factors are necessary for the attack of a disease : (1) *nidānas* or the predisposing causes which vitiate a *doṣa* ; (2) *doṣas* themselves, and (3) *duṣyas* or the deranged *dhātus.*

The *nidānas* cannot cause a disease by themselves acting on the *dhātus* ; that must act on the *doṣas* and vitiate them first, after which the vitiated *doṣas* in their turn act on the *dhātus* or the *duṣyas* and produce disease in them.

The *nidānas* that derange different *doṣas* such as *vāyu, pitta* and *kapha,* are as follows :

Derangement of the *vāyu* is produced by fighting with stronger people, excessive exercise, falling from a height, running, compressive pressure on the body ; injuries, fasting, remaining in water, swimming, staying awake at night, carrying heavy weights, excessive riding on elephants, horses, carts, or excessive walking, taking articles with an acrid, astringent or bitter taste, or dry, light or cooling things ; dry herbs and dry meat and certain cereals and pulses ; starvation, irregular food, taking excessive food ; restraining wind, faeces, urine, semen, vomiting, sneezing, eructation, tears, etc. *Vāyu* is specially deranged in windy and rainy season. It is also deranged during the morning and evening hours or immediately after taking food.

Derangement of *vāyu* causes roughness of the body, discoloration of the skin, abnormal movements in the limbs, pain, numbness, feeling of cold, weakness and loss of weight.

Derangement of *pitta* is produced by anger, grief, fear, hard labour, fasting, indigestion, excessive sex, use of acrid, saltish, pungent, hot, light, and indigestible articles of diet, sesamum oil, oil-cake, mustard seeds, linseed, flesh of the *guana* fish, meat of goats and sheep, curdled milk, butter-milk, whey, fermented barley water, spirituous drinks, acid fruits, acid, fermented liquid, etc. *Pitta* is especially deranged by heat, in summer and in autumn. During the

day, it is deranged at mid-day and mid-night, and when the food is being digested.

Derangement of *pitta* causes sweating, burning sensation, incoherent speech, fainting, formation of pus in the body and yellow coloration of the body.

Derangement of the *kapha* is produced by sleeping during the day, lack of exercise, the use of sweet, acid, saline, cold, oily, heavy, emollient and demulcent articles; certain varieties of rice, barley, wheat, gruel made of ground sesamum seeds, curdled milk, rice and milk boiled together, preparations from sugar-cane juice, meat of animals living in water or in marshes, tubers of waterlilies, sweet fruits of creepers, eating full stomach, eating soon after a meal. *Kapha* is especially deranged in winter and spring. During the day it is deranged in the morning and evening and immediately after eating.[19]

Derangement of *kapha* causes feeling of coldness and heaviness of the body, itching, swelling, excessive and sticky secretion from body orifices, and diminished response of the body to external environments and drugs.

Persons having *vāta prakriti*, *pitta prakriti* and *kapha prakriti* are more susceptible to diseases caused by *vāta*, *pitta* and *kapha* respectively.

When the above *nidānas* act upon the *doṣas*, the latter pass through five stages. The first stage is that of *chaya*, which means aggregation or accumulation of *doṣas* in general. The second stage is one of *prākopa* of *doṣas* which means that the accumulated *doṣas* are spread through the system. The third stage is called *prasara*; during this stage, there is something like a fermentation of the *doṣas*. This is moved about by *vāyu*, which though inanimate, is the cause of all minor activities. Just as when a large quantity of water is accumulated at any place, it breaks the embankment and flows down, so do the *doṣas* flow, sometimes alone and sometimes conjointly. In the whole body, in half of it or in whatever part the fermented *doṣas* spread, there the symptoms of the diseases shower down as it were, like water from the clouds. In the fourth stage, the premonitory symptoms manifest themselves. In the fifth stage, there is complete development of the characteristic symptoms of the disease.

Though the attributes of the *doṣas* are mutually opposed to one another, they do not always neutralise one another, and can grow

simultaneously violent in a system. When more than one *doṣa* is affected, the resulting symptoms get modified, though predominance of the influence on one particular *doṣa* may be clearly visible. The treatises on Indian medicine describe the characteristics of the principal and the accessory *doṣa* that are active in different diseases, Again, the disturbance of a *doṣa* does not necessarily mean that all its attributes have been exhibited in full strength ; it is possible that one or more of the attributes of a *doṣa* may be aggravated without disturbing the others. Hence it is necessary not only to discover which *doṣa* is aggravated but also to examine which attribute of which *doṣa* is aggravated. The nature of the disturbance of a *doṣa* is determined by the nature of the disturbance of the attributes involved. Thus, though the *doṣas* may only be three, the number of diseases they can give rise to is innumerable.

Classification of Diseases

Indian medical treatises classify diseases under various heads depending upon their causes, severity of symptoms, the parts or regions of the body involved, the pathology and pathogenesis, treatment and prognosis. Thus, according to the *Charaka*, there are two groups of diseases, judged by differences of origin or nature : curable and incurable. There are two groups of diseases judged by differences of strength : mild and violent. There are two groups of diseases judged by differences of substratum : those that have the mind for their substratum and those that have the body. There are two groups of diseases judged by differences of their causes, *viz.*, those due to disorders of the constituent elements, and those due to accidental causes. There are two groups of diseases judged by difference of their seats, *viz.*, those that arise from the *āmāśaya* (stomach) and those from the *pakvāśaya* (intestines).[20]

The *Suśruta* divides all diseases into three main classes as follows :

I. *Ādhyātmika* or Physical : This class is again subdivided into (1) *Ādi-bala-pravṛtta* or hereditary diseases which owe their origin to diseased semen or menstrual fluid, e.g., leprosy, piles, etc. This group is further sub-divided into two : paternal and maternal. (2) *Janma-bala-pravṛtta* or congenital diseases. These are caused either by diseased *rasa* or neglect on the part of the mother to satisfy her

longings during pregnancy, e.g., lameness, blindness, deafness, nasal voice, dwarfishness, etc. (3) *Doṣa-bala-pravrtta* or diseases caused directly by derangement of one or more of the *doṣas*, or by improper diet, or unhealthy habits or by one disease producing another. This group is further sub-divided into : (a) bodily, i.e., those produced by the *doṣas* such as *vāyu*, *pitta* and *kapha*, and (b) mental, i.e., those produced by the mental *doṣas* such as *rajas* and *tamas* ; the former being again divided into two diseases originating from disordered *doṣas* of the *āmāśaya*, and those originating in the *pakvāśaya* or the intestines.

II. *Adhibautika*, i.e., diseases caused by disturbances in the physical environment of men. These are called *samghāta-bala-pravrtta* and are due to external causes. They are of two kinds : (1) those caused by weapons, and (2) those caused by wild animals.

III. *Ādhidaivika* or diseases due to acts of God or nature. This class is divided into three sub-groups : (1) *Kāla-bala-pravrtta* or seasonal type. These are produced by the successive changes of the six seasons in the year, or by any variation in the atmospheric conditions. This type is sub-divided into two, according as the season exhibits its normal features or the contrary. (2) *Daiva-bala-pravrtta* or the providential type. These are caused by a curse or divine wrath or brought about by mystic charms or spells. This type is sub-divided into two : (a) those caused by thunder and lightning, and (b) those caused by various spirits. (3) *Svabhāva-bala-pravrtta* or the natural type. These are the results of natural processes such as hunger, thirst, old age, death, etc. This type is sub-divided into timely and untimely. Those caused by the influence of time, notwithstanding due care of health, come under the former class ; those caused untimely, from want of due care, come under the latter.[21]

Vāgbhata in his *Aśtānga Samgraha* gives a classification of diseases. According to him, there are seven groups of diseases (1) inherited (*sahajāta*) ; (2) arising in the womb or congenital (*garbhajāta*) ; (3) acquired after birth (*jatāja*) ; (4) accidents and other sudden events causing suffering (*pidaja*) ; (5) those caused by changes of seasons, etc. (*kālāja*) ; (6) caused by curses, etc. (*prabhāvāja* ; (7) innate or natural to human beings (*svabhavāja*).

These seven groups of diseases are again divisible into two classes each : (1) *Sahajāta* (e.g., leprosy, piles aud urinary diseases,

etc.) diseases are produced due to defects of *śukra* (semen) and *artava* (catamenial blood). (2) *Garbhajāta* diseases are produced due to the unwholesome regimen and improper conduct of the mother during pregnancy; these are *koubjya* (spinal deformity), *pangulya* (lameness), *paingalya* (abnormal complexion like reddish brown or brownish yellow) and *kilsa* (leprosy), etc. The two classes among them are : *annarasaja* (those caused due to the defects of foods or their products of digestion) and *dauhridavimanaja* (those produced due to the unwholesome regimen and improper conduct of one's self. (3) The two classes among *jatāja* are : *santarapana* (over-fooding) or *apatarpana* (fasting or lack of sufficient nourishment. (4) The two classes of *pidaja* diseases are : physical disorders or mental afflictions like *kshata* (wounds), *bhanga* (fractures), *prahara* (blows) or *krodha* (anger), *shoka* (sorrow), *bhaya* (fear), etc. (5) *Kālāja* diseases which include fever etc. caused by excess of cold, etc. are either *vyapannajas* (calamities, misfortune or corrupted atmosphere, destructive epidemics) or *asamrakshanajas* (diseases produced due to lack of hygiene and protection of the body). (6) *Prabhāvāajs* diseases are produced by the transgression against gods and elders and also to *shapa* (curse or malediction) and *atharvana* (black magic or sorcery) ; they have two classes among them : fever and the second possession by evil spirits. (7) *Svbhavājas* afflictions like hunger, thirst, old age, etc., occur in their proper time or in abnormal time ; the first kind occur even after proper care and protection of health, and second kind are caused by the lack of proper care and protection of the body.[22]

Diagnosis

Methods

According to the *Charaka samhitā*, there are three methods of diagnosing a disease. These are : (1) judgment of the inspired or the wise (*āptoupadeśa*), (2) observation (*pratyaksha*), and (3) inference (*anumāna*). To these three, the *Suśruta* added another, i.e., interrogation.

Indian Medicine admits verbal testimony as an independent *pramāna* (proof). It does not restrict this to the Vedas only but extends it also to secular writings, defining it in general terms as the testimony of a trustworthy person (*āpta*), who knows the truth and

communicates it correctly. People who have freed themselves from passion and ignorance by means of spiritual endeavour and knowledge, whose understanding embracing the past, present and future is pure, and at all times unclouded, they are the authoritative, the learned and the enlightened. Their word is unimpeachable and true. Why will such men, devoid as they are of passion and ignorance, utter anything but the truth ?[23]

A disease is recognized by its cause, origin, onset, location in the body, symptoms and signs recognized by sounds, touch, colour, taste and odour, complications, stages of aggravation, continuance, abatement and the result. One learns of these and the treatment thereof through the judgment of an authoritative person.[24] It initiates one on the path of making observations and drawing inference. In the absence of this, one cannot proceed further.

The next step in the diagnosis is observation (*pratyaksha*). A physician should examine with the ear the intestinal sounds, the sounds of the joints and of the finger knuckles ; variations in the patient's voice or any other sounds that may be observed in any part of the body. He should examine with the eye, the colour, the shape, proportions and the lustre of the body and whatever else that admits of visual inspection. He should examine the normal or abnormal smell from the patient's body. Then he should feel the patient's body by his hand, i.e., he should palpate different parts.

The examination of the patient's body by the sense of taste should be done indirectly by inference. Through interrogation, the physician should ascertain the taste in the patient's mouth ; insipidity of his body secretions by the lice, etc., deserting his body, and excessive sweetness of the body secretions by the crowding of flies on his body. In order to determine whether the patient's blood is healthy or vitiated by *pitta*, the physician should give a sample of it to a dog or a crow ; if they eat it, it is healthy, otherwise not.[25]

The next step in diagnosis is inference (*anumāna*). Inference of a disease may be drawn from the premonitory symptoms of the disease. Over-feeding upsets the digestion ; if a person has indulged in a heavy meal, then with the first symptoms of uneasiness, one may infer that the patient is likely to have diarrhoea. Before the onset of high fever, the hair of the patient may stand erect ; this is neither the cause of the fever nor is it co-existent with it, since it may

(destroyer of life); that which is very weak and cold foretells death. When it is excited by fever, it feels hot and fast. During passion (*kāma*) and hatred (*krodha*), it is fast; during mental worry, it is weak; if the digestive fire is low (*mandāgni*) and when the *dhātus* are weak, it is slow. When the *dhamani* is full of blood, it feels warm and weighty; when the digestive fire is kindled, the *dhamani* feels light and fast. In normal health, the pulse is strong and steady. Contentment makes the pulse steady."

Bhāvamiśra in 1558, A.D. describes the method of examination of the pulse and the type of pulse in different diseases. In his treatise *Bhāvaprakaśa*, he states : "The physicians feel the *nādi* at the root of the thumb of the right hand in males and the left hand in females. Its movements indicate the state of health or ill-health of the body. The examination is done by placing three fingers on the *nādi*. The first finger detects the movement of *vāyu*, the middle finger that of *pitta* and the third finger that of *kapha*. Vāta *nādi* jumps (*utpluta*), and the *kapha nādi* moves slowly (*mandagati*).[26]

Lolimbarājeeyam or *Viadhya jeevanam* by Lolimbarāja (1608-1633 A.D.) also describes how to examine the pulse; his description does not differ much from Śārangadhara and Bhāvamiśra. During the eighteenth and nineteenth centuries, scores of treatises on examination of the pulse were written and several hundred types of pulse patterns recognized for different diseases. Essentially, Indian physicians, correlated changes in it with disharmony in the *doṣas*.

The question as to when and from whom did the Indian physicians learn the examination of the pulse cannot be answered with certainty, though a few broad hints are available. Before Indian physicians, physicians in Egypt, China, Greece and even Arabia, knew of and practised examination of the pulse for diagnostic purposes. If Indians picked up this knowledge from Egyptian or Greek sources, its knowledge should have been available to them much before the twelfth century A.D. Contacts between India and China go back to the first century A.D. when the Buddhist monks Kāśyapa, Mātanga and Dharmarakśa carried the gospel of the Buddha to the Chinese Capital. Later many Chinese pilgrims came to India, notable among whom were Fa-Hien (399-415 A.D.), Hiuen Tsang (629-645 A.D.) and I. Tsing (673-687 A.D). These pilgrims were not interested in medicine and their chief concern was collection of Buddhist literature and

relics. Only I-Tsing knew something about medicine and studied it for some time at Nalandā. He seems to have been well-versed in Chinese medicine as well. He has left behind a record on his impressions of Indian medicine. He does not refer to existence of any pulse lore among the Indian physicians. His remark that "in the healing arts of acupuncture, cautery and the skill of feeling the pulse, China has never been superseded by any country of Gambu Dvipa (India)", may be interpreted to mean that he actually came across some form of pulse examination by the Indians, though not as effective as ancient Chinese.

During the twelfth century A.D., contacts between the Arab countries and India were very close. These contacts had started much earlier and had flourished during the 8th and 9th centuries A.D., when under the Baghdad Caliphs, many Indian physicians went there, lived there and some of them returned to India. Arabian physicians had picked up some knowledge of the examination of pulse from the Greek sources and they practised it widely and developed it further. It is probable that the Indian physicians returning from the Arabian countries brought along with them the knowledge of examination of the pulse. They realized its significance in the diagnosis of diseases, and correlated it with their concept of *doṣas* and disequilibrium in different diseases.

Since the time of Bhāvamiśra, diagnosis of disease by Indian physicians involves an eight-point investigation (*aśtasthāna pariksha*). These are : (1) judgment of the wise (*āptoupadeśa*), (2) observation (*pratyaksha*), (3) inference (*anumāna*), (4) examination of the pulse (*nādi-pariksha*), (5) examination of the eyes (*netra*), (6) tongue (*jhiva*), (7) voice (*sabda*), and (8) urine (*mutra*).

Detailed Diagnosis

Diagnosis in the Indian Medicine does not mean only identifying the disease; it comprises much more. To begin with, diagnosis is made of the causes (*nidāna*), premonitory indications (*purvarupa*), symptoms (*rupa*), and full extent of the disease (*samprapti*). Then the diagnosis is made of the presence of *dhātu-vaiśamya*, that is the increase or decrease of some of the *dhātus* as well as those of the *doṣas* and *malas*. Then the diagnosis is made of the stage of *dhātu-vaiśamya*. As we know, a disease passes through five stages : *chaya*, *prākopa*, *prasāra*, *purva-rupa* and *rupa*. Each stage has its own signs and symptoms.

To know the stage of the disease is important from the therapeutic point of view, because the same medicine is not useful or may even prove harmful when administered at a wrong stage of the disease. Furthermore, *doṣas* rarely get excited or deranged singly, and different *doṣas* may be excited or deranged at different stages in different patients having the same disease. All this has to be properly recognized and assessed.

Whether a particular symptom in the patient is a primary one or secondary one has to be assessed properly in Indian Medicine. The *Charaka samhitā* in this connection states : "It is seen that a particular disease operates as the cause (*nidāna*) of another disease...Thus from an enlarged spleen arises abdominal dropsy, and from this, swellings in other parts of the body. These diseases at first remain as principal ones. Then they become causes of other diseases. It is seen that when they become causes of other diseases, they still retain their individuality. Sometimes, however, they merge into the maladies they bring about so completely as to lose their individuality. Sometimes a particular disease, becoming the cause of another disease, disappears completely. A disease, again, may also not disappear after bringing about another whose cause it becomes.

"Thus diverse complicated diseases that are very painful are seen to afflict human beings in consequence of improper treatment ; as also of particular diseases being the cause of others. One disease may be the cause of many or of one, or many may be the cause of one, or many the cause of many. Thus dryness may cause fever, vertigo, delirium, and other diseases ; again, dryness may cause only one disease, fever. Also from many causes may spring one disease, e.g., fever from dryness and other causes ; from many causes, dryness and others, may spring many diseases such as fever and others.

"Sometimes one symptom belongs to many diseases ; also one symptom may belong to one disease. Many symptoms, again, are manifested by one disease ; also many symptoms are manifested by many diseases. The symptoms of several diseases that have been mentioned for a right ascertainment of the particular disease, are themselves so many diseases. But when the main diseases are to be considered ; they should be taken as symptoms only and not as separate diseases".[27]

Prognosis

Whether the disease that the patient is suffering from is curable, and if so, how long it will take the patient to get well again, is a question that every patient expects his doctor to tell him. This was important for the physician to know. In ancient times, if a physician undertook to treat a patient who suffered from an incurable disease and the patient died, he not only lost prestige among his colleagues and public but was also liable to punishment by the king. If a surgeon operated upon a seriously ill patient and the patient died, he was liable to be persecuted by the king if he failed to inform the king beforehand of the seriousness of the disease and the danger involved in the operation.

In ancient times, prognosis was taught and learnt very seriously not only by Indian physicians but all over the world. In India prognosis was made through a variety of procedures, such as, (1) a thorough examination of the patient so as to establish the diagnosis and the stage of the disease ; (2) examination of the general constitution of the patient ; (3) omens, and (4) dreams of the patient.

A patient having a history of disease with the following signs and symptoms, was regarded as suffering from an incurable disease : "the man who feels great pain in the upper region of his chest while speaking ; who vomits out the food, and whose ingested food in not digested even if retained ; whose strength wanes quickly ; in whom thirst increases excessively and in whom pain arises from the cardiac region ; a patient who has a deep hiccup and develops diarrhoea with haemorrhage ; a debilitated patient who develops abdominal distension and diarrhoea ; if constipation and excessive thirst set in an already weakened man ; if dry, severe cough develops in a man who suffers from fever in the forenoon and is devoid of strength and flesh ; a patient who develops dysponea, and is already having abdominal disease and subnormal temperature, thick urine and hardened stools ; a patient in whom abdominal swelling spreads to his feet and hands ; he has oedema in the feet and his calves are flaccid and there is pain in both the shanks.

"Further if a patient of poor complexion, vitality and digestive power develops swelling in the hands, feet, genitals and the abdomen ; if he constantly expectorates from his chest, copious quantities of phlegm which is tinged blue or yellow or with blood; an emaciated

man who develops sneezing and thick urine ; and who has cough and fever , an extremely debilitated patient in whom fever and diarrhoea develop before or after the oedema has set in ; an extremely emaciated man suffering from anaemia develops excessive thirst, rigidity of sight and deep breathing ; a man whose jaws and the sides of whole neck have become rigid, who is greatly afflicted with thirst and debility.

"Still further, in whom the vital breaths are active only in the chest ; a patient whose flesh, strength and digestive fire have ebbed low, faints and jerks his limbs about and finds no comfort whatever ; a patient in whom serious diseases arising from mutually conflicting etiological factors and requiring antagonistic lines of treatment grow up suddenly ; the man whose strength, intelligence, health, assimilation, flesh and blood deteriorate suddenly ; the man whose health ebbs away suddenly and whose natural disposition deteriorates suddenly".[28]

A patient was considered very close to death if he had the following symptoms : "a patient whose eyes are jaundiced, face swollen, temples devoid of flesh, is terrified and his body is hot ; a boastful patient who faints every time that he is raised in his bed ; a patient who is emaciated, eats very little, but excretes large quantities of urine and faeces ; a weak patient who eats a greater quantity of food than he used to do and discharges very little urine and faeces ; a patient who eats delicious nutritive food but continually deteriorates in strength and complexion ; a week patient who groans, is short of breath, has loose motions and is afflicted with thirst and parching of the mouth ; a patient who is short of breath and makes all sorts of bodily contortions ; a patient of poor complexion, strength and degestive fire who develops inspiratory dyspnoea and is overwhelmed with phlegm.

Other symptoms of an about to-die patient are : "a weak patient who develops a rigid upward look in his eyes and the sides of his neck are constantly moving and he is very thirsty and has dryness of the mouth ; a patient whose cheeks are swollen, has high fever and cough, and suffers from colicky pain and hates to eat ; a patient whose head, tongue and face are distorted, his eye-brows droop low and his tongue is covered with thorn-like fur ; a patient whose phallus is greatly shrunken and the testes hang very loose ; a patient whose flesh is wasted and is reduced to skin and bones, is fast fading and

does not eat any food[29] ; a patient who having breathed out a long expiration, followed by a short inspiration, faints ; a patient whose breathing has been shallow, has lost his body heat, feels piercing pains in the groins and experiences great discomfort".[30]

"On his way to death is a patient who develops hiccup while he is already suffering from a disease characterized by drooping of the eye-brows and severe internal burning pain ; a man whose body is swollen with oedema due to *vāta* and his faeces is loose and he has thirst".[31]

While assessing prognosis, the constitution of the patient with which he was endowed, was considered important. This was judged by taking into consideration the patient's mind, semen, marrow, bones, fat, muscles, blood and skin. The normal function of each of these eight elements (*sāras*) showed itself through certain characteristic features.

"Normal mind (*satva*) consists in memory, veneration, wisdom, valour, purity, and devotion to useful work ; normal semen consists in lustre of the body and firmness, white colour of the bones, teeth and finger-nails, and sexual desire ; normal marrow consists in pulmpiness, strength, splendour of the body, depth and softness of voice and largeness of the eyes ; normal bones consist in large head and shoulders, firm teeth, jaws, bones and nails ; normal fat consists in cool urine, perspiration, soft voice, large body and capacity to bear hardships ; normal muscles consist in a body without openings or cracks in it, deep-seated bones and joints, and muscular built ; normal blood consists in smooth copper-coloured nails, eyes, palate, tongue, palms and soles ; normal skin consists in its lustre and softness. Examination of the patient, keeping in view the above eight characteristics (*sāras*), prevents a physician from arriving at an erroneous prognosis.

"A person with a large body does not necessarily have great strength, nor is a lean one devoid of strength ; it is indeed seen that men whose bodies are of small dimensions or are lean, are still possessed of strength".[32] This fact was ascertained by keeping in view the eight constitutional characteristics.

Dreams of patient were also considered important in assessing prognosis. "If one dreams of drinking wine along with dead bodies and attacked by dogs, he dies early due to fever. A person who

dreams that he is wearing red garlands, has red body and red clothes and is embraced by a woman, dies of *raktapitta* (haemorrhagic disease). A person who in dreams of traveling in a southern direction on buffalos, dogs, pigs, camels, or on donkeys, dies of consumption. One who dreams that on his chest is growing a horny creeper, bamboo or palm tree, dies of *gulma* (abdominal tumour).

"A person who sees in a dream that on his naked chest is growing a lotus, while he anointed with *ghee*, is offering oblations to the fire without flames, dies of leprosy. One who in a dream drinks various kinds of oily substances in the company of the outcastes, dies of diabetes. One who in dreams sinks in water dancing along with devils, dies of *unmāda* (insanity). One who in dreams, while dancing, is embraced by a dead body, dies of epilepsy. One who in dreams rides donkeys, camels, cats, monkeys, tigers, pigs, dead bodies or on jackals, dies early. A person who in dreams eats *apupa* (a kind of sweet) and *shaskulis* (a kind of preparation of blood) and vomits articles of the same shape after awakening, does not survive. A person who sees lunar or solar eclipses in dreams, suffers from eye-diseases. If one sees in dreams the sun or the moon falling down, he loses his eye-sight."

"The following dreams were generally considered inauspicious : growth of bamboo or creepers on the head ; resting of birds on the head, shaved head, the head being surrounded by crows, vultures, etc.; losing one's way in a place full of reeds, bamboo, creepers, thorny plants etc. ; sleeping in a chasm or cremation ground ; falling down in dust or ashes ; sinking in water or mud ; being carried away by a strong flow of current ; singing songs ; wearing of red garlands or clothes ; increase of age or of limbs ; application of oils to the body ; marriage, shaving and purgations, getting gold, iron etc. ; loss of both the shoes ; falling down of legs or skin ; too much joy, scolding by the angry parents ; falling down or destruction of lamps, planets, stars, teeth, idols of gods and eyes ; breaking of mountains ; entrance into a jungle having red flowers, or into the abode of sinful people or into a place full of distress and full of darkness or into the womb of mother ; falling down from a palace or hill ; being swallowed by a fish ; seeing people who are not good in appearance, are undressed or have a stick in hand or have red eyes or who are black".[33]

Indian medical texts give lists of omens that indicate prognosis.

"It is bad omen if the physician while dishevelled, naked, weeping, or not ceremonially clean, sees the messenger coming ; if messengers come to the physician while he is asleep, or in the act of cutting something ; if the messengers approach the physician while he is in the act of tending the sacrificial fire, or offering food balls to the manes ; if the messengers approach the physician when he is talking or thinking of inauspicious things ; if the messengers approach the physician while he is dealing with or talking about dead, burnt or destroyed things ; if the messenger that comes to the physician happens to be woman that is miserable, frightened, hurried, terrified, unclean or of a bad character, or if the messengers be three in number, or if they be deformed or eunuchs ; if the messenger happens to be mutilated in any of his limbs, or if he is an ascetic or a diseased man, or one given to cruel deeds."

The list continues : "if the messenger comes riding in a carriage drawn by a donkey or camel ; if the messenger has sticking on him straw, chaff, flesh, bones, hair, nails, teeth, broom, pounding stick, winnowing basket, loosened bits of leather from a shoe, straw, sticks, husk, cinders, clod of earth or stone ; if when the messenger is talking to the physician about the patient's condition, physician sees the evil omens, or sees a sorrowing man, a dead body, or the adornments suitable to a corpse ; if he sees things that are broken, burning or destroyed or hears words denoting them; tastes pungent and acute things, or smells rank odours as of a corpse, or touches objects having an exceedingly harsh feel, or in short, perceives about him any such other inauspicious sensation, whether before or during the speech of the messenger".[31]

When the physician has started for the patient's house and he comes across the following things on his way, he should know them as bad omens, and better return than see the patient sneezing, stumbling, shouting, forbiddance, reviling ; any untoward accident to the clothes, the turban, the upper garment, the umbrella, or to the pair of sandals, seeing a corpse or a mutilated person, or the falling of a totem-tree, flag staff, flag or filled pots, reports of death and inauspicious things, pollution by ashes on dust, the crossing of the road by a cat, dog or snake, cries of cruel beasts and birds as they go towards the south, the sight of overturned beds, seats and carriages.[35]

After he has reached the patient's home, the physician should take the following as bad prognosis omens ; "if immediately on entering

sweet-meats, white coloured flowers, sandal paste, attractive articles of food and drink, a carriage full of people, a cow with her young one or a mare with her colt, or a woman with her child."[39]

The list further includes birds like *mynah*, *siddaratha*, *saras*, crane, *chtāka*, swan, bird of paradise, blue jay, and the peacock ; fish, goats, elephant's tusks, conch shells, *ghee*, or the sign of *swastika* ; a mirror, white rape seed, ox-bile, the smell of fragrant odours, the sight of perfectly white objects, the tasting of sweet tastes, good and auspicious sounds of beasts, birds or human beings ; the sight of the hoisting of umbrellas, flags and banners ; the sounds of praise or kettle drums, drums and conches, of benedictory cries and of Vedic recitation, and the touch of pleasant and auspicious breeze.

The following were also auspicious and indicative of good prognosis : the people of patient's household, together with the patient, being endowed with good conduct, faith, friendly disposition, abundant wealth and resources, happiness, accumulation of money and power by easy means ; the acquisition of the desired things with ease ; the availability of all the required drugs and their successful application ; the patient's vision in dreams of mounting the top of houses, mansions and mountains, or on the backs of elephants, bulls, horses, and of men ; the sight in dreams of the moon, the sun, the fire and Brāhmins, of cows, of men carrying milk ; or of the crossing of seas, of the attainment of growth and the release from calamity ; discourse in dreams with the gods and ancestral shades wearing a propitious aspect ; the sight in dream of flesh, fish, poison, excrement, umbrella and mirror ; the auspicious sight in dreams of white-coloured flowers, riding in dreams on horses, bulls or in chariots or travelling towards the north-east ; weeping aloud in dreams ; of rising from a fall or the vanquishing of enemies.[40]

Thus we see that prognosis was based upon rational observations as well as empirical and mythical ideas and beliefs.

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9

Treatment

Treatment under Āyurvedic system comprised both medical and surgical aspects depending upon the nature of the disease. Surgeons in ancient India, unlike in other contemporary civilizations, were as much respected as physicians.

(A) Medical Treatment

Ancient Indian physicians extracted medicines from the vegetables, the animals, and the earth. The vegetable products formed the major source of their pharmacopoeia. Animal products used as drugs included flesh, fat, bones, marrow, tendons, horns, hoofs, hair, nails, skin, bile, blood, excreta, urine and semen. Of the earthy products *śilājeet* was the most commonly used ; others were gold, silver, copper, lead, tin, iron, arsenic, antimony, precious stones, salts, earth itself and sand.

Herbals

The vegetable products are classified as *vanaspati*, *vanaspātya*, *virudh* and *ośadhi*. *Vanaspati* denotes such trees and plants that produce fruit but not flowers ; *vanaspātya* that produces both fruit and flowers ; *virudh* are creepers ; and *ośadhi* are plants drying up after fruitation.

The parts of vegetable used as drugs included root, stalk and shoots, pith, bark, leaves, flowers, fruit, thorns, exudation, juice, milk, oil, ashes, etc.

The vegetable products used as drugs were collected from the

forests. They were also grown in gardens adjoining the houses of the physicians. Such a garden had to have suitable soil and other facilities for cultivation. The soil that is glossy, firm, steady, black or yellowish or red, and does not contain any sand, potash or any other alkaline substance, and is favourable to the germination of plants and easily pervious to the roots of plants growing thereon, and which is supplied with the necessary moisture from a close or adjacent stream or reservoir of water, is recommended for the growth of medicinal plants and herbs.[1] Its surface should not be broken or rendered uneven by the presence of holes, ditches, gravel and stones, nor should it be loose in its character ; it should not be disfigured by ant-hills or used for the purposes of cremation or as execution ground ; nor it be the site for a holy temple.

When and how to collect the plant products for medicinal purposes is an art that needed training and experience. Only such plants are to be collected as are sown in their proper season and have attained their fullness of growth, taste, potency and smell; whose smell, colour, taste, touch and specific action have not been impaired by season, sun, heat, fire, water, wind or insects ; which are fully mature and growing on the northern side. Of them again, the branches and leaves which have recently grown should be gathered between the rainy season and the spring, the roots should be gathered in the summer or in the winter from trees whose ripened leaves have been shed, the bark and milk of plants in the autumn, and their pith at the end of the autumn, and the flowers and fruit in their proper season. Collection should be done after performing auspicious rites, living a pure life, having performed the purificatory bath, wearing white garments, having worshipped the gods, the Aświn twins, the cows and Brahmins, having observed a fast and facing the east or north.[2]

After collecting them, the plant products should be stored suitably. The vessel in which they are kept should be well covered and its opening tied securely. The room in which such storage vessels are kept should be windless (except for one window) and be safe against fire, water, moisture, smoke, dust, mice and animals. The whole building should face the east or the north and in this building flower-offering and sacrifice should be performed daily.[3]

Minerals

Of the earthy products used as drugs, *śilājeet* was the most important. Its origin, properties and uses are described in detail[4]. It is a kind of gelatinous substance secreted from the sides of the high-altitude rocks, when they are heated by the sun in the months of June and July. It contains tin, lead, copper, silver, gold and iron ; hence it is also called as *shadyoni* (lit. derived from six sources). There are varieties in it depending upon the preponderance of particular elements as perceived by taste. That which is black and glossy, is heavy and devoid of sandy particles and smells like cow's urine, is the best.

Śilājeet has a bitter and pungent taste and an astringent after-taste. It has heat-producing and body-purifying properties. It is taken after the body has been cleansed by means of adequate emetics and purgatives. It can be taken every morning after it has been properly liquefied with other drugs or with the articles of food such as rice and flesh of forest animals. About 10 gms. (1 *tola*) of *śilājeet* taken daily for some days tends to improve the strength and complexion of the body, cures diabetes mellitus and enables the user to witness a hundred summers on earth, free from disease and decay. Cases of diabetes, leprosy, epilepsy, insanity, elephantiasis, consumption, oedema, haemorrhoids, internal tumours, jaundice and chronic fever prove readily amenable to the curative efficacy of *śilājeet*. Indeed, there is no such bodily distemper which does not yield to its highly curative virtues. It acts as a potent solvent in cases of long-standing *sarkara* (gravel) in the urinary bladder and also stone.[5]

Classifications

Medicines were prescribed and administered in different forms ; they included : (1) *churna* (powders), (2) *svārasa* (juice), (3) *kalka* (paste), (4) *kvātha* (decoction), (5) *phānta* (infusion), (6) *śitākāśaya* (cold infusion), (7) *paniya* (weak decoction), (8) *pramathyā* (strong decoction), (9) *matha* (solution in cold water), (10) *kashirapāka* (decoction in milk), (11) *yavāgu* (gruel), (12) *avaleha* (extract), (13) *vatikā* and *gudika* (pills and boluses), (14) *modaka* (blouses in syrup), (15) *khandapāka* (confections), (16) *bhāvāna* (macerated powders in fluids), (17) *putapāka* (roasted), (18) *kanjika* (sour liquid), (19) *drāvaka* (distilled mineral acids), (20) *asāva* and *arista* (medicated

spirituous liquids), (21) *ghritas* (medicated oils), (22) *ghritapāka* (preparations of medicated *ghrita*), (23) *tailapāka* (medicated oils).

Drugs of vegetable, animal and earthy origin together are classified in different ways. The *Charaka samhitā* classifies them into fifty categories, mainly according to their use against different symptoms. The *Suśruta samhitā* classifies about 400 drugs under thirty-seven groups, according to their action on different *doṣas* and *dhātus*. The *Suśruta* first divides medicines into two classes, viz., *samsamana* and *samsodhana*. The former are medicines which rectify the deranged state of the *doṣas* and calm their excited action without promoting their excretion ; this class is further sub-divided as : *vāta-samsamana-varga*, *pitta-samsamana-varga* and *ślesma-samsamana-varga*. The latter class of medicines are those which remove collections of deranged *doṣas* from the body by promoting their excretion ; they include drugs such as emetics, purgatives, errhines and depilatories.

Mode of Action of Drugs

Drugs, like other things in the world, are also composed of the five *mahābhūtas*, viz., *ākāśa*, *vāyu*, *tejas*, *jala* and *prithvi*. *Bhautika* composition of a drug is ascertained, among other things, on the basis of taste. A drug tasting sweet is inferred to have *prithvi* and *jala* *māhabhūtas* in predominance, and a drug tasting sour has predominance of *jala* and *agni*, and the one tasting saline is dominated by *agni* and *vāyu*.

As we have already seen, the three *doṣas* are also composed of five *mahābhūtas* with any one or two *mahābhūtas* predominating in each, as for example, *kapha* is dominated by *prithvi* and *jala* ; *pitta* by *agni*, and *vāyu* by *vāyu* and *ākāśa*.

If a disease is caused by the aggravation of *kapha*, the patient should be given drinks and drugs which have less of *prithvi* and *jala*. He needs more of *agni*, *vāyu* and *ākāśa*. Hence drugs and diet containing these *mahābhūtas* predominantly are recommended. The same rules apply for aggravation of the other two *doṣas*.

For deranged *kapha*, drinks, diet and drugs that are alkaline, astringent, bitter and pungent are recommended. Physical exercise, walking, wakefulness, swimming, exposure to heat or sunlight, emetics and inhalation therapy, fomentation, application of hot ointments, are advised.

For deranged *vāta*, drinks, diet, drugs that are hot, strength-giving, sweet, salty and sour are ideal. Exposure to sun, massage, enema therapy, rest, and application of ointments are recommended.

For deranged *pitta*, drinks, diet and drugs that are bitter, sweet, astringent and cold are advised. Moon-light, underground residence, purgation, blood-letting, and anointment of the body are recommended.

The above is, however, only a partial explanation of the action of drugs and diet. Other factors also come into the picture. Besides the influence of the *rasa* (taste) of the drug, the other factors involved are : *vipāka* (post-digestive taste or content), *virya* (potency), and *prabhāva* (special action). To know beforehand as to how a particular drug will act on the body, it is necessary to know the above characteristics of each drug. This applies to all the articles of diet as well. Indian physicians studied these properties of the drugs and the articles of diet extensively and elaborately. They also classified articles as earthy (*parthiva*), watery (*apya*), fiery (*āgneya*), airy (*vāyavya*) and ethereal (*ākāśatmaka*). Such studies helped them in selecting the drugs or diets when a particular *dhātu* or *doṣa* or a combination of them was increased or decreased or deranged.

Administration

Before administering any drug, Indian physicians noticed other relevant features of a drug such as the region in which it is grown, the season in which it is extracted, the method of extraction, how and where it is stored, indication and contra-indications of its administration, its preparation and purification, how it is prepared or compounded or mixed with ; whether it increases or decreases the *dhātus* and to what extent, etc.

If a medicine belongs to the same territorial region as the patient's, it is likely to prove more useful.

According to the *Charaka samhitā*, an ideal drug is that which requires to be taken in small dose, which is quick in action, and is curative of even an excessive degree of morbidity, which is easy to take, which is light in digestion, palatable, pleasing, curative of the particular disease, not harmful even if complications arise, not very depressant, and is possessed of the most agreeable smell, colour and taste.[6]

Not only the characteristics of the drugs but also of the individual patient to whom it is to be given must be known before its administration.

Indian medical treatises lay stress upon the fact that a physician should examine the patient thoroughly before administering the medicine. He should know the region in which the patient was born, the place in which he was brought up and also where he contracted the disease. He should also know the patient's usual diet, regimen, strength, disposition of mind, factors agreeable to the constitution, power of digestion, the common diseases of the area, and things which are wholesome for the inhabitants of that region, and enquire into the chief causes of the aggravation of the *doṣas*.[7]

Diet

Āyurveda lays as much stress on diet as on the drugs for the patient. Even for an healthy person, it recommends proper diet keeping in view his constitution as well as the weather conditions outside. Certain articles of diet are considered incompatible and therefore contra-indicated as combination. These and some other instructions about diet are as follows: meat of animals living in marshy regions is incompatible with the following seven: black gram, honey, milk, sprouting grains, stalks of lotus, raddish, *gur*. There is a marked incompatibility between fish and milk, and particularly with the kind of fish known as *chilichima*. Milk should not be taken after eating green vegetables, raddish, etc. The following are incompatible with one another: meat of *varaha* (a wild boar) with that of porcupine; meat of spotted antelope and hen with curds; uncooked meat with liver; raddish with black gram; spouting grains with stalks of lotus; fruit of *Artocarpus lakoocha* with black gram, gur, milk, curds, and *ghee*; banana with butter milk, curds, and fruit of palmyra; *kakamachi* (night-seed) with black pepper, and long pepper mixed together with honey or with *gur*. *Kakamachi* should not also be taken when it is cooked in a utensil in which fish or dry ginger were cooked ; the same cooked in a separate utensil but kept overnight, should not be taken.

One should avoid long pepper cooked in the oil in which fish had been previously fried or in *ghee* kept for ten days in a utensil made of bronze, and also eating hot substances along with

marking nut. *Bhasa* (a kind of bird) which is held at the end of the rod over fire and roasted, and *kampilla* (*Kamila rootlera*) prepared with butter-milk are harmful. *Payasa* (boiled milk with rice and sugar) wines and *krishara* (drink made from sesamum, rice and black gram) should not be taken simultaneously. Honey, *ghee*, fat, oils and water should not be mixed in equal or unequal measures for consumption as they have antagonistic qualities. Honey and *ghee* are incompatible with each other, even in unequal quantities, taken in a medium of rain water. There is incompatibility between honey and lotus seeds, between honey with *maireya* (drink prepared from dates) and a drink prepared from sugar, and between *kshaireya* (milk, rice, sugar boiled together) with *mantha* (coarse gram mixed with water). *Haridra* fried in mustard oil is not good. *Upodaka* (*Basela cordifolia*) prepared with the paste of sesamum produces diarrhoea. Meat of *balaka* (a kind of crane) mixed with *varuni* (a kind of drink) is incompatible with sour gruel. The same (*balaka*) kills the man early when it is fried with the fat of *varaha* (wild boar). In the same manner, *tittiri* (a partridge), peacock, *godha* (a kind of lizard), *lava* (a kind of bird) and *kapinjala* (a partridge), when they are fried in castor oil on the fire produced by the sticks of castor, is a killer. The meat of *harita* (a kind of bird) roasted at the end of a stick of *haridra* (barberry) over the fire of sticks of *haridra*, puts an end to life. So does the same meat when covered with ashes or dust. Any article of diet or medicine which provokes and sends out a *doṣa* from its normal seat, though it does not excrete or expel the *doṣa* out of the body, is also forbidden. Under such circumstances evacuation of *doṣas* and also the subsidence of the *doṣas* by articles possessing opposite qualities to the first, is desirable and the body may be restored to health by using foods which have opposite qualities to those causing the disturbance.[8]

Care of the Patient

While proper drugs and diet are essential for a cure, they by themselves are not enough. There are other factors too, upon which depend the success or otherwise of the treatment. The *Kāśyapa samhitā* describes all the factors upon which the success of the treatment depends. There are four pillars of treatment. When these four pillars are equally strong, a curable disease is bound to be cured.

The four pillars are : physician, medicine, patient and attendant.

After describing the essential features of the physician and the medicine (both described already), *Kāśyapa samhitā* lists the essential qualities of the patient and the attendant for the successful treatment of the disease. The patient, suffering from a curable disease, should possess the strength of mind, physical vigour, intellect, body and senses and abundance of endurance and splendour. The patient should be able to tell correctly and clearly the causes, premonitory symptoms, other signs and symptoms of the disease, complications, stages, alleviations and aggravations (by the administration of different articles). He should have full faith in God, Brāhmins, teachers, physicians and friends and the attendants. His most prominent quality should be humility and self-restraint. He should correctly follow the instructions of the physicians.

The attendant should be one whose passions have been extinguished and possessed of good health and strength. He should be respectful to the physician, possess knowledge of nursing and willing to do all types of work. He should not be born in a lowly family. He should not suffer from duplicity or dual loyalties. He should have control over his senses and temper, and be tolerant.[9]

Rasayana and Vajikarana

Besides the drugs and prescriptions for the treatment of diseases brought about by *dhātu-vaiśamya*, Indian medical treatises describe two other classes of medicines called *rasayāna* and *vājikarana* for the general toning up of the system of healthy persons. These medicines are not specific for any particular disease but are intended to improve the general health of the patients and alleviate diseases in general.

Rasayānas have the capacity to impart superior *rasa* and *dhātus* to the body. They are elixirs of life for preserving and increasing vigour, restoring youth, improving memory and preventing disease. About them, the *Suśruta samhitā* states : A wise physician should (invariably) prescribe some sort of tonic (*rasayāna*) for his patients in their youth and middle age, after having their system (properly) cleansed by the application of a *sneha* and purifying remedies (emetics and purgatives). A person whose system has not been (previously) cleansed with the proper purifying remedies (emetics and purgatives)

should not, in any case, have recourse to such tonics inasmuch as they would fail to produce the wished-for result, just as the application of a dye to a piece of dirty cloth will prove non-effective.[10]

Vājikarana are for increasing virile strength. A youth in normal health taking regularly some sort of *vājikarana* remedy may enjoy the pleasure of youth every night during all the seasons of the year. Old men wishing to enjoy sexual pleasures or to secure the amour of women, as well as those suffering from senile decay or sexual incapacity and persons weakened with sexual excesses, should do well to submit themselves to a course of *vājikarana* remedies. They are highly beneficial to libertine, handsome, and opulent youths and polygamists. If properly taken, the *vājikarana* remedies make a man sexually as strong as a horse (*vāji*) and enable him to cheerfully satisfy the heat and amorous ardours of young maidens, a fact which has determined the nomenclature of this class of (medicinal) remedies.[11]

Drugs and other therapeutic measures can be administered not only by mouth but through other openings also. Indian physicians administered liquid medicines into the rectum, the urethra and the vagina, and inhalations and fumigations through the nose. They also applied dry and wet heat to the body by means of different ingenious procedures.

Enema

Vasti-karma or injections into the rectum were introduced by means of a pipe to which was attached a urinary bladder of some animal such as the buffalo, bull or goat. The *Suśruta samhitā* gives a complete description of the apparatus and the procedure. The length of the pipe should be six fingers for an infant of one year, eight to ten fingers for a boy of eight and an adult of sixteen years respectively; the girth of its outer surface being equal to those of the small finger, the ring finger, and middle finger respectively. The pipe should have bulb-like protrusions attached to it at one of the ends above a space of one finger and a half, two fingers, and two and a half respectively in the three aforesaid cases. The girths of their mouths (to be introduced into the rectum) should be respectively made equal to those of the calibres of feathers of a crow, a falcon and a peacock,

and the girth of the channels of the main body of the pipes should respectively be such as to let a pulse (*monga* or *masha*), and a *kalaya* pulse progressively larger to pass through them. The pipe may be made either of gold, silver, copper, iron, brass, ivory, horn or wood. It should be straight, smooth and firm, tapering at the top like the tuft of hair in the tail of a cow, and expanded at its mouth.

The bladder (*vasti*, hence the name *vasti-karma*) should be flexible, neither too thick nor too thin, and its dimensions should be such as can easily accommodate the required volume of fluid. This bladder should have been cleansed, tanned and dyed beforehand. It should be kept soft by repeatedly lubricating it with a greasy substance. Its mouth which should be heated with a piece of hot iron to remove the pores in it, should be bent and lightly fitted to the pipe. This apparatus needs care to keep it in proper working shape.

The volume of fluid used should be equal respectively to two, four and eight handfuls (*prasritas*) of the patient himself. This quantity may, however, be increased if the age, strength, bodily capacity of the patient so permits.

Application of enema is said to be particularly useful in diseases due to the action of the deranged *vāyu*, *pitta* and *kapha*, and the vitiated conditions of the blood.[12]

Injections into the urethra and vagina were introduced by similar contrivances, the tubes being adapted in length and thickness to the passages for which they were intended.

Inhalants

Inhalations of certain drugs through the nose and the mouth was meant for routine daily use (*prayogika*), for their soothing effect (*snehana*), expectoration (*vairechana*), suppressing cough (*kaśaghna*), and for causing vomiting (*vamaniya*).

The pipe used for inhalation could be any one of the substances of which the enema pipe is made of. The end that is inserted into mouth should have the girth of the small finger and the aperture that can admit a *kalaya* pulse, the other end should have the girth equal to that of the thumb and the aperture sufficiently large to hold the *dhuma varti*, the medicinal stick, which is lighted and whose fumes are inhaled. Here again, there are definite instructions about the length of the pipe used for inhalation of different types : it should be 48 fingers

for daily use, 32 fingers for soothing inhalation, 24 fingers for expectoration, 16 for cough suppression and vomiting.

While inhaling medicated fumes, the patient should sit in an easy and comfortable posture, maintain a cheerful frame of mind and keep his eyes cast down towards the ground.[13]

The smoke of Indian beech, sweet fennel, Indian *bdellium*, inhaled after taking food is said to be very good for health.[14]

Heat therapy

Application of heat in different forms and through different procedures was resorted to frequently in different diseases. This may be (1) dry heat (*tāpasveda*) applied by means of heated bricks, sand or cloth; (2) steam (*uśmasveda*), medicated or otherwise, applied through various devices so as it leads to a lot of perspiration ; (3) application of hot medicinal substances such as plasters (*upanāhasveaa*) or fomentation by means of cloth wrung out of medicated hot fluids; or (3) bath (*dravasveda*) with heated medicated water or with medicated milk, broth, oil, etc.

The *Suśruta* describes an interesting procedure for applying heat in the case of a patient subject to shivering. Girls young, beautiful and skilled in the sport of love, with faces glowing like the full moon of autumn and darting forth beams of love from their languid blue lotus-like eyes, with eye-brows moving in ardour of desire and with dreary foreheads throbbing with the gentle pulsations of love, with girdles sliding down from their slender waists, with their splendid buttocks naturally making them lazy in their steps, with their lips vying with the ripe *vimba* fruit in their luscious redness, with their elevated breasts, and smeared with saffron and *aguru* pastes and clad in thin transparent garment, fumigated and scented with the vapours of burnt *aguru*, should be asked to take the patient into a firm embrace like a forest creeper entwining itself around a sylvan tree, and the girls should be told to keep off as soon as the patient is heated. The patient thus cured of the disease by the fond embrace of these beautiful girls should be treated to such a wholesome repast as would be welcome to him.[15]

The *Charaka* lists thirteen different methods of applying heat leading to sudation. These are : mixed fomentation, hot-bed sudation, affusion, sudation, bath sudation, hot-house sudation, stone-bed

sudation, trench sudation, cabin sudation, ground-bed sudation, pitcher-bed sudation, pit sudation and under-bed sudation.

The procedure adopted for the use of medicated steam from a kettle to produce sudation is as follows : Take the medicinals indicated, such as, the root, fruit, leaves, buds etc. of the vegetable group or the flesh and the head of birds and beasts of hot potency. Mix them with sour, salt and unctuous articles as are necessary, or with urine, milk and other similar articles. Decoct them in a pot closing the lid tightly so as not to allow the steam to escape. Make a tube of the shape of the elephant's trunk having two or three bends in it with the leaves of either bamboo or leaves of India beech or *mudar* ; its length should be between 3 to 6 feet and its circumference at the proximal end 1½ feet and at the distal end about 9 inches. The patient should inhale this steam after anointing himself with an unction made from *vāta* curing articles.[16]

For hot house sudation, a round chamber is built on an even and well-laid out plot with the frontage on its eastern or northern side, about seven or eight cubits distant from a water course. Its height should be sixteen cubits at the most and the diameter also the same. The walls and roof should be made of earth and should be well plastered, leaving a number of air holes. Inside it is a platform one cubit wide, at a distance of one cubit from the floor. This should be all round the chamber except at the entrance. An earthen oven four cubits wide and of a man's height should be built inside the chamber. This oven should have many air holes and a lid at the top This oven should then be filled with the sticks of catechu, *sal* and other similar kinds of wood, and ignited. When the wood is fully burnt leaving no smoke behind and has attained the right temperature, the patient well anointed with *vāta*-curing substances, and covered with a cloth, should be made to enter it.

Having entered and getting on to the platform, he should lie down either on his right or the left side as is comfortable to him. Though overcome by sweating and fainting he must not leave the platform. He must cling to it as long as life's breath is in him. If once he lets go his hold of the platform, being overpowered by perspiration and fainting, he will be unable to find the doorway and immediately lose his life. So he should, on no account, leave the platform.

In the autumn season, a day was fixed for the operation by calculating an auspicious astral combination. The physician kept a fast on that day so as to purify his body and mind. Then he ascended a hill, selected a full grown *ashita mushka* (*ghantā pārula*) tree of middle age, growing on soil recommended in the works on pharmacy. The next day after formally invoking the spirit of that tree, the physician fell it, reciting the following incantation: "O thus possessed of mighty virtues, O thou endowed with fiery potency, may thy potency never decrease or vanish. Stay here, O thou blissful one, execute my work, and after the performance thereof, thou shalt be at liberty to ascend to the heavenly regions".

After performing the *homa* ceremony, with white and red flowers, the physician cut the wood of the above-said tree into small pieces and put them in a place protected from the wind. Then he placed pieces of unslaked limestone over them, and burnt them to ashes with the lighted faggots of dried sesamum plants. When the fire was almost burnt out, he collected the ashes of the limestone and the *ghantā pārula* wood separately and stored them.

Similarly, he burnt to ashes the wood as well as the leaves, roots and fruits of *kutaja*, *palāsha*, *ashvakarana*, *pāribhadra*, *vibhitaka*, *argvadha*, *tilvaka*, *arka*, *snuhi*, *apāmārga*, *pātalā naktamāla*, *vrisha*, *kadali*, *chitraka*, *putika*, *indra-vriksha*, *āsphotā*, *ashvamāraka*, *saptachchhada*, *agnimantha*, *gunjā* and the four species of *koshātaki*.

Then he immersed eight *pala* measures of the substances known as the *shankhanābhi*, etc. in water along with the ashes collected already as stated above, and let the whole thing boil, stirring it continuously. After the optimum thickness and consistency of the whole thing was reached, it was taken down from the oven and poured into an iron pitcher, and its opening covered carefully. This was an alkali of the mild potency. If to it is added the ashes of *katasharkarā*, etc., it makes the alkali of medium potency, and if in addition, the powders of the drugs known as *danti*, *dravanti*, *chitraka*, *lāngulaki*, *putika-pravālā*, *talpatri*, *vidha*, *suvarchikā*, *kanakakshiri*, *hingu*, *vachā*, and *vishā*, or with as many of them as are available, each weighing four *tolas*, are added, it makes the alkali strong.[20]

An alkali which is just white, is shiny and slimy and sticks to the place of application, is neither too strong nor too mild and can bring morbid fluid out rapidly, is considered good.[21]

For application of an alkali, the area should be well exposed and the affected part scarified with the alkali and covered over with a piece of cloth for a period needed to count slowly up to one hundred.

In the treatment of piles by caustics, the face of the instrument should be covered and held for the duration of 100 *matras*. In case of discharge from eye-lid, the eye-lid should be inverted and pupil covered by cotton and the caustic applied in a very thin layer like the leaf or petal of the lotus. This is also the method for application over tumours of the nose; the patient should sit facing the sun and the edge of nose should be raised and caustic then applied for 50 *matras*.

After applying the alkali, one should see, after wiping the part with cotton, that the part has burnt correctly. If it has burnt properly, *ghee* and honey should be applied and the part should be cooled by applying milk, or sour gruel (water and boiled rice) along with *ghee* and other articles which are sweet and cold.

The patient should not be given food materials which block the assimilation of digested food. When the disease has not been cured due to its deep-rootedness, an ointment prepared from *dhanyamla* (sour gruel) with liquorice root and sesamum seeds should be applied.

The part which is correctly burnt by the caustics is black like the fruit of the *jambu* (rose-apple) and depressed. If the part does not show these appearances and also if it is coppery-red or has pain, itching, etc., then it is not properly burnt. In such cases caustics, should be applied again. If the part is excessively burnt by caustics. bleeding, fainting, burning sensation and fever, etc., may occur. Specially when the anal region is excessively burnt, obstruction to passing of stools and urine may occur. Impotency or even death may occur due to the over-burning of rectum.

When the nose gets over-burnt, there is splitting of the nasal bridge, and contraction and loss of sense of smell. When the ear is excessively burnt, one cannot hear properly. In such cases, the part should be washed with acidic liquids like sour gruel and an ointment containing honey, *ghee* and sesamum seeds should be applied.[22]

There are definite contra-indications to the use of alkalies in certain cases. A weak person, an infant, an aged person, men of

timid disposition, a patient suffering from abdominal dropsy with general anasarca or from haemoptysis, a pregnant woman, a woman in her menses, a person suffering from an attack of high fever or urethral discharges, or emaciated with chronic inflammation of the lungs, or a person subjected to fits of fainting or abnormal thirst or a person suffering from impotency, or a woman suffering from retroversion or introversion of the uterus or prolapse of the vagina, are unfit for being cauterized with alkalis.

Moreover, application of alkalis is not permitted over the veins, nerves, joints, tender bones or cartilages, sutures, umblicus, genitals, parts covered over with a thin layer of flesh, inside the nails and other vulnerable parts of the body, and in diseases of the eyes, except those which affect the eyelids.[23]

When properly and carefully used, alkalis are considered the best of remedies. But if used improperly, they can prove equally harmful. The *Suśruta* warns severely against the use of alkalis by those who are not well-informed about their use. It says : "An alkali administered by an ignorant physician is to be dreaded more than poison, fire-blows with a weapon, thunder bolts or death itself."[24]

Cauterization with Heat

Burning the affected part was considered even better than the application of alkalies in certain cases. According to the *Suśruta samhitā*, a disease burnt with fire is cured for good and knows no recrudescence ; and diseases which ordinarily baffle the skill of a surgeon or a physician, and never prove themselves amenable to medicinal or surgical remedies, are found to yield to fire.[25] Burning the part (cauterization) is particularly prescribed in cases of tumours, fistula, swelling of testicles, elephantiasis, swollen glands, decolorization of the skin, chronic wounds or ulcers, ophthalmia, headache, haemorrhoids and other diseases. This was done by means of red hot iron of various shapes, burning medicinal sticks (*varti*), cow's tooth (*godanta*) and different crystalline stones (*surya kanta*). Fluid substances like honey, syrup, oil and wax brought to a boiling point, were also used. The part could be cauterized in circles, points, lines or on the whole surface, depending upon various indications and contra-indications.

After the particular part has been correctly cauterized, *ghee* and honey should be anointed and ointments which are unctuous and cold

should be applied. The characteristics of a correctly cauterized part are presence of serum (*laśikā*), bursting sounds, colour as of a ripe palmyra fruit or a dove after the bleeding has stopped, little or no pain and early healing. The characteristics of over-cauterization or under-cauterization are the same as those of an accidental burn. Under-cauterization leads to movement of parts of muscles, shrinking of vessels, burning sensation, pain, feeling as though smoke is emerging out from the part, thirst, fainting, deep ulcers and even death. In case of under-cauterization, medicines to be given are cold and hot substances alternately, starting with cold.

Cauterization is contra-indicated for those to whom the administration of caustics is also prohibited. It is also contra-indicated for those who have foreign matter in their body or internal bleeding or ruptured intestines or organs and for those who are suffering from severe ulcers.[26]

Blood-Letting

Indian physicians bled the patients suffering from abscesses, enlargement of the spleen, and inflammations of different parts of the body. This they did by applying leeches, by cupping, sacrification or by cutting the superficial veins.

Application of leeches was the safest method of letting out the blood, and caused no pain. This was used in infants and old people or those of timid nature, or where the patient was too weak to stand any operation,

The area where the leeches were to be applied was abraded by rubbing over it a mixture of dust and cow-dung. The leeches were taken out of their receptacle, sprinkled over with water containing mustard seeds and turmeric powder, and kept in a basin full of water so that they become fresh and vigorous. They were then applied to the affected part. If they failed to stick on to the desired spot, a small incision was made to let the blood come out. While sucking blood, the mouths of the leeches assume a horse-shoe shape and their necks becoming raised and arched. Cold water is sprinkled on the leeches while they are sucking.[27]

For opening a vein (venesection) in order to take out the blood, the patient should be seated on a stool about a foot high with his face turned towards the sun. He should keep his legs in a drawn

up or contracted posture resting his elbows on his knee joints and the hands with his two thumbs closed in, his fists placed near the neck over his sterno-mastoid muscles. Then the surgeon should ask another man standing behind the patient to tie a cloth bandage over both his arms and the back in such a way so as to raise the veins in regions above the bandage. The patient should be asked to take a deep breath and hold it. The surgeon should now perform the operation on the desired spot. This procedure can be used for opening any vein of the head.

If the patient is to be bled from one of the legs, the affected leg should be placed on a level ground, while the other leg should be held in a somewhat contracted posture at a litte higher place. The affected leg should be bound with a piece of linen below the knee joint and pressed with the hands down to the ankle. A cloth ligature should then be tied four fingers above the region to be incised upon, after which the vein should be opened.

If bleeding is desired from one of the arms, the patient should be made to sit with his two thumbs closed in his fists. A cloth or rope ligature should be tied four fingers above the part to be incised upon and the vein opened. The veins can also be opened from the back, the shoulder, the chest, the abdomen and the hip, depending upon the part affected.

A successfully pierced vein bleeds in a stream almost simultaneously with the thrusting of the knife, and spontaneously stops after a *muhurta.*

It needs a lot of practice to be able to perform a successful venesection as veins are slippery like fishes. Properly performed, it provides more speedy relief than does the application of medicated oil, etc. The maximum quantity of blood permitted to be drawn is one *prastha* or six *pala* or equal to what comes in both the palms joined together.

There are contra-indications mentioned in blood-letting as well. An infant, an old man, a parched man, one fatigued and emaciated and starved, a person of timid or cowardly disposition, a person who has had excessive drinking or sexual enjoyments or tired with the troubles of long journey, a patient who has been treated with purgatives, emetics or enema, a man who has passed a sleepless night, an impotent or emaciated person, one afflicted with cough, asthma, high

fever, phthisis, convulsions, paralysis, thirst, epilepsy, should not be bled. Incisions should not be made into those veins which are not fit for opening or are invisible or cannot be ligatured properly.[28]

Blood can also be drawn by means of a cow-horn with a small piece of cloth bound round the pointed end, or with the help of a hollow calabash in which a burning wick is placed.[29]

Arrest of Haemorrhage

To arrest excessive bleeding after venesection, four methods are described :

1. *Sandhāna* –contraction of the wound by astringent decoctions of *Chebulic myrobolan* and the barks of the *pancha-valkala* (five barks).
2. *Skandāna* –thickening of the blood by the application of severe cold.
3. *Pāchana*—dessicating or drying up the wound by ashes.
4. *Dahana*—cauterizing the veins to make them shrink.

Vāgbhata also describes these methods of arresting haemorrhage and suggests that if the ordinary means do not check the bleeding, the vessel must be again opened at a point in its course beyond the bleeding area, or actual cautery applied.[30] Chakrāpani also repeats these directions.

Abscess and Ulcer

Indian physicians gave careful attention to assessing whether an inflammation had suppurated or not, as successful treatment, according to them, depended largely upon this factor. Signs and symptoms of a suppurated abscess are described in great detail. An abscess was opened or probed only when it had suppurated and was localised. The physician who opened an unsuppurated or unripe swelling out of ignorance, and a man who neglected a fully suppurated one, was looked upon as the vilest *chandala* (low born) for his wrong diagnosis.[31]

An ulcer growing up like a fleshy tumour with its edges raised like those of the genital of a mare, painful and containing pus inside it which comes out copiously, was regarded as incurable. An ulcer which was soft and raised like the horn of a cow, or the one which was moderately raised or elevated at its base, and secreted an exuda-

tion or vitiated blood, or a thin slimy secretion, was likewise regarded as incurable. An ulcer with an embossed or heaved up centre and one dipped or fissured at its extremity was regarded as past all remedy.[32] This description of ulcers fits in with malignant ulcers or carbuncles.

The *Suśruta* describes dozens of steps and procedures in connection with the treatment of different types of ulcers. For blackening (*krishna-karma*) the white cicatrix which occasionally results because of defective healing, the treatment prescribed is to take several *ballataka* seeds, soak them in the urine of a cow and then dry them in the sun, the process being repeated for seven days. After this, they should be kept for a week immersed in a pitcher full of milk. Then the seeds should be cut into two and placed again in an iron pitcher. Another pitcher should be buried in the ground with a thin and perforated lid p'aced over its mouth, and the pitcher containing the seeds should be placed upon it with its mouth downward, the meeting rims of the two being firmly joined with clay. After this, a cow-dung fire should be lit around the upper pitcher. The oily material that dribbles down from the seeds is collected in the lower pitcher. This should then be mixed with a powder made after burning the hoofs of horses and buffalos. The mixture applied to the white cicatrices changes their colour. Wood of certain trees such as *phala sneha* can also be used ins'ead of *ballataka* seeds.[33]

Arrow Wounds

Different type of wounds, their characteristics and management are dealt with in the *Suśruta samhitā* in detail. It describes sixty different procedures for their treatment. Many of them deal with wounds caused by the arrows.

A wound that still retains a part of the arrow inside it, is painful and swollen, has soft granular flesh growing at its edges and has a blackish discoloration around. The wound does not heal, pus forms inside and it gives a burning sensation. It may obstruct the flow of blood, if lodged in a vessel, and if it is in one of the natural passages, it may obstruct normal function of that passage.[34]

A wet plaster applied over the skin of the area where an arrow head is lodged, dries up quickly. Violent movement of the part causes pain locally.

Metallic pieces, if retained long, becomes a part of the tissues; non-metallic, do not. Foreign bones break up into pieces; a horn retained inside occasionally bends.[35]

Different methods have been suggested for removing any foreign body such as an arrow. One of the methods of removing the protruding arrow, is as follows : the bottom of the shaft should be tied to the string of a bow, strung and fully bent down, and the shaft should be ejected by giving a full twang. As an alternative, a horse should be harnessed in the fashion known as the *panchangi vandhanam* (lit. bound in the five parts of the body), and the end of the arrow should be bent down and tied to the bridle. Then the horse should be so whipped as to raise its head first, thus pulling out the embedded shaft from its seat of lodgment by the jerk of its head. Another method is to select a high and tough bough of a tree ; this should be lowered down and tied to the bent end of the shaft as in the preceding case. Then the bough should be let loose, thus pulling out the shaft with its protruding shaft.[36]

In the case of traumatic wounds, the *Suśruta samhitā* recommends immediate cooling of the part.[37]

Vāgbhata in his *Aśtānga Samgraha* gives directions for cleaning and suturing of the wounds. He states : "Movable bones, foreign materials, dust, grass, hair, coagulated blood etc. should be removed and the overhanging flesh, bones, joints should be replaced correctly and then after the bleeding has stopped, suturing should be done by hair, fibres of Indian hemp etc. through a needle, by means of cotton thread. The four methods of suturing are : *gosh phanika* (like a sling), *tunnasevanya* (continued sutures), *vellitakam* (winding), and *granthi bandhanam* (interrupted). The names themselves indicate their mode of suturing and they are used according to the nature of the wounds. The precaution to be taken while applying sutures is that the needle should not be introduced too closely or at long intervals ; it should neither be very deep nor very superficial. After the sutures have been applied, a powder made of *anjaṇa*, *madhuka* (liquorice root), *nimb* (neem trees), *rodhra* (*Symphocos recemosa*), *priyangu* (*Prunas mahalebe*), *sallaki phala* and *kshauma* (cotton) and *mashi* mixed with honey and *ghee*, should be smeared and then the bandages, etc. be applied.[38]

Bandages

While the *Suśruta samhitā* describes fourteen different types of bandages, Vāgbhata in his *Aśtāga Samgraha* describes one more. These fifteen bandages are as follows : *kosha* (hollow cylinder or sheath), *dāma* (a tail of a quadruped ?) ; *ustanga* (?), *svastika* (circular cross bandage), *anuvellita* (encircling bandage), *uttoli* (broad bandage), *mandala* (circular bandage), *sthagikā* (supporter), *yamaka* (double bandage), *khatva* (four-tailed bandage) *china* (banner bandage), *vibandha* (circular chest bandage), *vitāna* (canopy bandage), *gophana* (concave bandage) and *panchangi* (five-tailed bandage).

Many of the names themselves indicate the character of the bandage. The *kosha* bandage is to be tied on the digits of the fingers, *dāma* is to be tied at joints (or on narrow parts); *ustanga* on hanging parts ; *svastika* on joints ; *kurcha* on the middle part between the eye-brows and between the nipples, arm-pits, eyes, cheeks and ears ; *anuvellita* on the extremities ; *uttoli* on neck and male genital organ ; *mandala* on the edge of the penis ; *yamaka* on two interrelated or confluent inflammations ; *khatva* on jaw, temporal part and cheeks ; *china* on the outer corner of the eye ; *vibandha* on abdomen, thighs and back ; *vitāna* on head etc. and other broad parts of the body ; *gophanā* on the nose, the lips, the chin and the thighs ; and *panchāngi* on the parts above the neck.

The bandage should be tight on hips, arm-pits, groins, thighs and head ; moderately tight on the extremities, face, ears, neck, penis, testicles, back, sides, abdomen and the chest ; it should be loose over the eyes and on the joints.

Fifteen different materials were used for bandages, including the barks of trees. Knots of the bandages were advised to be tied away from the wound. The students practised tying bandages over the dummies provided for the purpose.

There are certain wounds over which a bandage is contra-indicated. These are leprosy wounds, those caused by burns, diabetic carbuncles, wounds caused by the bite of rats, alkali wounds, poisoned wounds, those having severe inflammation of the muscles, decaying wounds, spreading wounds and those at the anal region.[39]

According to the *Suśruta samhitā*, a bandage plays a more important part than a medicinal plaster as regards its healing and cura-

tive efficacy, inasmuch as it materially contributes to the purification and healing of an ulcer and keeps the joint steady.[40]

Fractures

Management of fractures is dealt with elaborately in the *Suśruta samhitā*. It pays heed to the fact that different types of bones, viz., *kapāla* (flat), *ruchaka* (small cubical), *taruna* (cartilages), *valaya* (thin curved bones with no cavity) and the *nalaka* (long bones with medullary cavity) show different effects upon them under similar trauma. Thus after a certain trauma, while the cartilages bend, the long bones break, flat bones show only multiple cracks (star-shaped) and the small bones get fragmented.[41]

Different fractures described by the *Suśruta* are : (1) *Karkataka*, depressed fracture ; (2) *Aswakarna*, complete oblique fracture ; (3) *Churnita*, comminuted fracture ; (4) *Picchita*, fracture by compression, (5) *Asthichallita*, subperiosteal avulsion ; (6) *Kāndabhagna*, complete spiral fracture ; (7) *Majjānugata*, impacted fracture ; (8) *Atipātita*, complete compound fracture ; (9) *Vakra*, green-stick fracture ; (10) *Chinna*, incomplete fracture ; (11) *Pātita*, comminuted fracture of flat bones ; (12) *Sphutita*, fissured fracture.

Four main principles guided them in a case of skeletal injury. These principles were : (1) *Anchana*, i.e., traction ; (2) *Pidāna*, i.e., manipulation by local pressure ; (3) *Sāmksepa*, i.e., apposition and stabilization ; (4) *Bandhāna*, i.e., immobilization.

Immobilization was provided by means of splints. The wood of different trees such as *madhuka*, *udumbara*, *aswatha*, *palāsha*, *kukubha*, *vansha*, *sarya* and *vata* was utilized for making the splints ; the particular wood by itself was supposed to have healing properties. Barks of the trees were also used for providing splintage. Their concave surface fits in well over the convex surface of the limbs ; moreover, this surface being soft acts as a cushion for the part. In case of fractures of the lower limbs and the pelvis, a 'fracture immobilization bed' was used. This consisted of a wooden cot to which were fixed five nails, two each on opposite sides and points, in order to fix the two joints, and one nail at the end of the sole. This limb placed in it was fully immobilized.[42]

Ideal results after treatment of the fracture were deemed to have been attained, when (1) there was absence of any gap between the

broken fragments, (2) absence of shortening, (3) absence of deformity, and (4) return of painless and effortless movements.[43]

Besides the fractures, the *Suśruta samhitā* discussed dislocations as well. Six different types of dislocations described are as follows : (1) *Utpiśta*, fracture dislocation ; (2) *Vishlista*, dislocation due to tearing of ligaments ; (3) *Vivartita*, anterior or posterior dislocation ; (4) *Avaksipta*, downward displacement; (5) *Atiksipta*, marked displacement of articulating surfaces ; (6) *Tiryakksipta*, oblique dislocation.[44]

Care of a Surgical Case

Care of the patient before, during and after a surgical operation was given due attention and is described in detail. Vāgbhata in his *Aśtānga Samgraha* states that before the operation, the patient should be given the food which he likes,[45] and also the wine. According to him, the food prevents fainting and wine makes the patient insensitive to pain caused by surgical instruments. Food, however, is not given to the patient before the operation if it is a case of difficult labour, abdominal disease, urinary stone, or a disease of the mouth.

Before the operation is started on the patient, all the instruments useful for the treatment of ulcers, like *yantra* (blunt instruments), *shastra* (sharp instruments), *kshāra* (caustics), *agni* (appliances for burning and cautery), *jambavaushtha* (a kind of rod), cotton, lint, leaves, thread, water jars, cold and hot water, couldrens, fans, etc., should be kept ready. Persons of amicable disposition and will power should be deputed to assist the surgeon.

After making the arrangement, obeisance be made to the gods and the Brahmins. Gift of curds, *akshata* (grains of rice yellowed with turmeric), food, drinks, gold ornaments and pearls are offered to them. The patient should lie down with his face towards the east, and tied up. Then the physician should make one incision rapidly with a sharp instrument, avoiding the *marmas*, blood-vessels, ligaments, joints and bones until the pus-filled site is struck. Even in large swellings, the length of the incision should not exceed two fingers. Another incision should be made two or three fingers from the previous one, if the boil (*shopa*) is big. The wound should be probed by the left forefinger if it is very big ; by a probing instrument, if it is not very big, fleshy and deep ; and by a bamboo

reed, if it is going in different directions ; and by a bristle of wild boar, if the opening is very small.

An oblique incision is recommended over the eye-brows, cheeks, neck, arm-pits, abdomen and groins. If the oblique incision is made on other parts, blood-vessels and ligaments are destroyed and severe pain results, healing is late and fleshy protuberances are formed.

After using the sharp instruments. the patient should be given cold water so as to sooth him. The swelling should now be pressed by the fingers and the wound cleaned by decoctions, the secretion from the wound should be absorbed by the cotton, and the wound fumigated with articles like Indian *bdellium*, eagle wood, yellow resin, sweet flag root, rape seed, asafoetida, salt and leaves of *neem* mixed with *ghee*, which subside the pain as well as drive away evil spirits. Then the wound should be filled with suppositories anointed with the paste of honey, *ghee* or sesamum, and later covered with powdered barley and bandage tied over it.[16]

Some Major Surgical Operations

The *Suśruta* describes some of the major surgical operations performed with precise skill and medical expertise. As only limited means were available at that time, these operations were not less than surgical marvels of the time.

Abdominal Operations

In cases of perforated abdomen with the intestines protruding out owing to an injury, Suśruta recommends the protruded intestines be gently replaced into the abdominal cavity in their original position. If the intestines, too, have perforated, large black ants should be encouraged to bite the perforated part. Afterwards the bodies of the biting ants should be separated from their heads. Then the intestines be rinsed with milk to remove any foreign body attached to them such as grass, dust, blood, cotton, etc., and lubricated with *ghee* and gently pushed back into the cavity and reinstated in their original position. The finger nails of the surgeon should be clean and well-pared while he performs such an operation.

In case the intestines could be only partially introduced, the interior of the throat of the patient should be gently rubbed with a finger. The urge for vomitting thus engendered, would help the

proper replacement of the intestines into the abdominal cavity. As an alternative, the patient may be bathed is cold water, then lifted up with the help of attendants and given a shake. This tactics help re-setting of the intestines into their natural position.

If re-introduction of the intestines into the abdominal cavity is difficult because of the narrowness of the orifice of the wound, it should be extended or widened with a small incision as required, and the intestines replaced. The orifice or mouth of the wound should be carefully sutured as soon as the intestines have taken their natural position. Intestines dislodged from their proper placing, or not re-set into their correct position, or coiled up into a lump, might cause death.

After the intestines have been placed properly, the wound should be bandaged with a piece of silk cloth saturated with *ghee* and the patient given a draught of tepid *ghee*, with castor oil, for an easy passage of the stool and wind. To expedite healing of the wound, a medicated oil prepared from the bark of the *aśvakarna*, *dhava*, *sālmali*, *mesha shringi*, *shllaki*, *arjuna*, *vidāri*, and *kshri* trees and *valā* roots should be applied to the wound. For a year, the patient should forego any physical exercise.[47]

Lithotomy

For patient having urinary stone which has withstood medicines, massage and other external treatment, Suśruta recommends operation for the removal of the stone. He however, warns clearly that the surgical operation in such cases may not prove successful even in the hands of a skilful and experienced surgeon. Before operating upon, the surgeon should obtain permission of the king.[48]

Describing the procedure of the operation, Suśruta states : the patient should be soothed by the application of oleaginous substances and his system should be cleansed with emetics and purgatives. He should then be fomented and made to take his meal. Prayers, offerings and prophylactic charms should be offered and the instruments and surgical accessories required in the case should be arranged properly. The surgeon should try his best to encourage the patient and infuse hope and confidence in him. A person of strong physique and calm disposition should be first made to sit on a level board or table as high as the knee-joint. The patient should then be made to lie on

his back, on the table placing the upper part of his body in the attendant's lap, with his waist resting on an elevated cloth cushion.

Then the elbows and knee-joints of the patient should be contracted and bound up with linen. After that the umblical region of the patient should be well rubbed with oil or with *ghee* and the left side of the umblical region should be pressed down with a closed fist so that the stone comes within the reach of the operator.

The surgeon should then introduce into the rectum, the second and third fingers of his left hand, duly anointed and with the nails well pared. Then the fingers should be carried upward toward the rope of the perineum, *i.e.*, the middle line so as to bring the stone between the rectum and the penis, when it should be so firmly and strongly pressed as to look like an elevated *granthi* (tumour).

An incision should then be made on the left side of the raphe of the perineum at the distance of a barley corn and of sufficient width to allow the free egress of the stone. Special care should be taken in extracting the stone from its cavity so that it may not break into pieces nor leave any broken particles behind (*i.e.*, inside the bladder) because even if they are small now, they are likely to grow big in course of time. Hence the entire stone should be extracted with the help of an *Agravakta yantra* (a kind of forceps the points of which are not too sharp).

A surgeon who is not very well informed about the regional anatomy of the place or is not expert in performance of this operation. can cause death of the patient.[49]

Paracentesis

When a patient has a distended abdomen and there is evidence of a fluid present in it (ascites), the Indian surgeons knew that the fluid must be taken out. Suśruta's technique for this was as follows : the abdomen should be anointed with oil and fomented with hot water. Then attendants should hold the patient firmly by the armpits. The surgeon should make a puncture with a surgical instrument known as the *Virihimukha*, on the left side of the abdomen below the umblicus, the breadth of the thumb in depth and a distance of four fingers to the left of the dividing line of hair on the abdomen. Simultaneously with that, a metal tube or a bird's quill, open at both ends, should be introduced through the passage of the puncture to

allow the fluid accumulated in the abdomen to ooze out. The entire quantity of the fluid should not be allowed to ooze out in a single day. It should be gradually tapped at intervals of three, four or five to sixteen days. After the complete outflow of the fluid, the abdomen should be firmly tied with a bandage in order to prevent further accumulation of fluid.[50]

Craniotomy

When all efforts at delivering the infant have failed and it is already dead inside the uterus of the mother, the *Suśruṭa* recommends craniotomy using the following technique : "the head or skull of the embryo in such cases should be severed with the knife known as the *Mandalagra* or the *Anguli śastra* ; then having carefully taken out the particles of the skull bone (*kapāla*), the foetus should be drawn out by pulling it at its chest or at the shoulder with a *shanku* (forceps). Where the head would not be punctured and smashed, the foetus should be drawn out by pulling it at the cheeks, the eye-sockets. The arms of the foetus should be severed from the body when they are found to be obstructing the passage, and then the foetus should be drawn out. The abdomen of a child, dead in the womb, should be pierced and the intestines drawn out, in the event of the former being swollen into a flatulent (*vāta*) distension like a leather bag (for holding water), as such a procedure would remove the stiffness of its limbs, and then it should be drawn out. The bones of the thigh (*jaghana kapāla*) should be first cut out and removed, in case they are found to have adhered firmly with the passage".[51]

Cataract Operation

"Inside the crystalline lens, if anything is seen like a half-moon-shaped drop of water or pearl, hard, irregular or thin striated or shining, painful or red, caused by the deranged *doṣas*, the oleaginous applications and fomentations are to be tried first at a time when it is neither hot nor cold ; then the patient should be directed to look towards his own nose. Then the surgeon after separating the white part from the black part and avoiding the vascular network and leaving the parts above and below intact, should pass a *Yāvāmukhi śalaka* (or sharp needle having its end resembling a wheat grain)

through a natural opening on the side, steadily holding the rod with the thumb, index and middle fingers.

"If the operation be required on the right eye, the left hand, and if on the left eye, the right hand of the surgeon should hold the needle in puncturing. A successful puncture is known by the escape of a drop of fluid and an audible sound. The surgeon should then sprinkle woman's milk just after the puncture, and keeping the needle there, whether the deranged *doṣa* be movable or not, should apply fomentations externally by means of oily remedies for the deranged *vāyu.* The crystalline lens is next to be scarified by the sharp end of the needle ; keeping the needle fixed in the side of the eye, the patient should be directed to sniff so as to destroy the phlegm of the lens. The proper scarification is indicated when the lens appears brilliant as the sun uncovered by the clouds. Then the vision being clear, the needle in the side of the eye is to be removed ; and the eye is to be well soaked with *ghee* and bandaged properly".[52] Vāgbhata describes a similar method of operation.[53]

Plastic Surgery

Surgical techniques of the *Suśruta* which attracted the attention of the world most were those which we now categorize under plastic surgery. Making a new nose or ear out of the flesh from elsewhere in the body in cases where the original had been damaged or cut off was possible then as it is now. "For making a nose, the leaf of a creeper, long and broad enough to fully cover the whole of the severed or clipped off part, should be taken, and a patch of living flesh, equal in dimension to the preceding leaf, should be sliced off (from down upwards) from the region of the cheek, and after scarifying it with a knife, swiftly adhered to the severed nose. Then cool-headedly, the physician should tie it up with a bandage decent to look at and perfectly suited to the end for which it has been employed. The physician should make sure that the adhesion of the severed parts has been fully effected, and then insert two small pipes into the nostrils to facilitate respiration, and to prevent the adhesioned flesh from hanging down.

"After that, the adhesioned part should be dusted with the powders of *pattanga*, *yashtimadhukam* and *rasanjana* pulverised together ; and the nose should be enveloped in *karpasa* cotton and several times sprinkled over with the refined oil of pure sesamum. Clarified butter

should be given to the patient for drinking and he should be anointed with oil and treated with purgatives after the complete digestion of the meals he has taken. Adhesion should be considered complete after the incidental ulcer has been perfectly healed up. The nose should be again scarified and bandaged in the case of a semi or partial adhesion. The adhesioned nose should be tried to be elongated where it would fall short of its natural and previous length, or it should be surgically restored to its natural size in the case of an abnormal growth of its newly formed flesh".[54]

The *Suśruta's* technique of making the new nose was being practised in India till lately. Description of this operation was published in the *Gentleman's Magazine* in 1794,[55] and after that a leading surgeon of London, Joseph Constantine Carpue, published his results in 1816, which led to the world-wide publicity for the technique. Later on, many modifications of the technique were adopted and a new science of plastic surgery introduced in the realm of surgery.

For making a new ear-lobe, the *Suśruta* recommends taking a patch of live flesh from the cheek of a person devoid of ear-lobes in a manner so as to have one of its ends attached to its former seat [cheek]. Then the part, where the artificial ear-lobe is to be made, should be slightly scarified (with a knife) and the live flesh, full of blood and sliced off as previously directed, should be adhesioned to it (so as to resemble a natural ear-lobe in shape).[56]

Surgical Instruments

The *Suśruta samhitā* describes surgical instruments under two main heads: Blunt (*Yantra*) and Sharp (*Śastra*).

Blunt Instruments

There are 101 surgical instruments, each one having a specific name. They are divided into six categories as follows :

1. Cruciform (*Swastika*) : They consist of two lengths of iron bars usually eighteen fingers long, loosely held together in the middle with a pin. The handles are either rounded off or bend at an angle at their ends, so that they are easily and firmly graspable. The holding ends have shapes like that of beasts or birds of prey. There are twenty-four instruments in this class, nine shaped at the end like those of the

crow, heron, vulture, falcon, and other birds of prey. They serve to extract foreign bodies that are prominent and are easily handled.

Of all the varieties of *swastika* instruments, the heron forceps (*kanka-mukha*) is the best, for it can be easily introduced and turned in all directions, and also it grasps firmly and extracts a foreign body with ease and can be applied without any harm to all parts of the body.[57]

II. Forceps (*Sandamsa*): There are two instruments under this class with and without the arms. They are sixteen fingers long. They are especially useful in extracting foreign bodies from the skin, flesh, etc. These forceps are comparable with the modern dressing forceps and with the forceps still used by the goldsmiths. Those with arms have their counterpart in the pair of pincers still used by the blacksmiths.

III. Picklock-like (*Tāla*) : There are two instruments in this class. Twelve fingers in length, they are shaped like the jaws of a fish. They may be made either with a single blade (*ektāla*) or with double blades (*dvitāla*), soldered at one end, the hooked ends being free. They are intended for the purpose of extracting foreign bodies from the ear, nose and other outer canals of the body. The ear scoop now used by the barbers of India for extracting wax from the ear is a *tāla yantra.*

IV. Tubular Instruments : Twenty in number, they are of different lengths, diameters, calibres, open at one or both ends—all this depending upon the use to which they are put to. They are used to inspect or remove fluids, pus and foreign bodies from different canals of the body that open outside. They are used in the treatment of fistula-in-ano, piles, tumours, abscess, hydrocele, ascites, stricture of the urethra, stricture of the rectum, for administering enemata and injections into the bladder, etc.

For urethral stricture, the *Suśruta samhitā* recommends gradual mechanical dilatation of the urethra by means of tubes made of iron, wood or lac. The same tube should be used for three consecutive days, then another of a larger calibre for three more days, and so on, till the canal is fully dilated.[58]

Horn of a cow used for cupping is also a blunt tubular instrument. It is eighteen fingers long, its base forming the mouth of the instrument, is three fingers wide.[59] It is conical in shape and the cone

covered with cotton and are used for wiping or cleaning abscesses etc. Three varieties have their ends spoon-shaped, with beaked mouths, and are used for applying caustic solutions. Three types of *śalākas* have their ends shaped like the end of *jambava* fruit; three have their ends hooked; these six varieties are used for applying cautery. There is one variety used for extracting tumours from the interior of the nose. There is a variety for applying collyria to the eyes and another for clearing the urethra; this last one has a diameter the size of the stalk of the *malathi* flower.

VI. Accessory Instruments (*Upayantra*): They are twenty-five in number: thread, braided hair, bandages, leather, bark of trees, creepers, cloth, stone or pebble, hammer, palm of the hand and sole of the foot, finger, tongue, tooth, nail, mouth, hair, the ring of a horse's bridle, branch of a tree, spittle, morbid excretions of the patient, objects exciting happiness, a loadstone, fire, and medicines.

A bundle of hair tied to a long thread is mentioned by Suśruta to have been used for the extraction of fish-bones from the throat. "The patient is directed to swallow the ball of hair with some liquid. Then emetics are administered to excite vomiting. During this act, the foreign body gets entangled in the meshes of the ball, which is then pulled out by the thread outside, thus extracting the fish bone".[64] Vāgbhata also describes it similarly.[65]

Charaka mentions the practice among the recently-delivered woman of pushing a braid of her hair into her throat to help the expulsion of the placenta.[66]

Horse hair was the material used by ancient Indian surgeons for sutures. Besides it, they used sutures of fine thread, or the fibres of the bark of *asmantaka* (*Caesalpina digynia*), or threads made of hemp or flax, fibres of *murvya* (*Sansevieria zeylanica*) or *guduchi* (*Tinspora cordifolia*). Mouth parts of the large black ants were also used as suture material in cases of perforated intestines.

Ayas kānta or loadstone was used for extracting an arrow from the wound, if it was without barbs.[67]

By means of these 101 blunt instruments, twenty-four different kinds of operations were performed. These were: (1) extraction by moving to and fro (*sālyaniraghatani*); (2) filling the bladder or eyes with oil (*pūrana*); (3) bandaging and binding by rope (*bandhana*); (4) raising up and incising a part for removing a thorn or bringing together the

edges of a wound (*vyuhana*); (5) contracting or curling up (*vartana*); (6) transferring or removing from one part to another and moving a foreign body (*chālana*); (7) turning round (*vivartana*); (8) exposing or opening out any part (*vivarana*); (9) pressing as by finger to let out pus from an abscess (*pidana*); (10) clearing the channels such as urethra, rectum etc. (*mārga vishodhana*); (11) extraction by pulling or loosening a foreign body fixed in muscles etc. (*vikarshana*); (12) pulling out (*āharana*); (13) pulling up (*ānchana*) ; (14) elevating or setting upright as the depressed cranial bones or ears (*unnamana*); (15) depressing as of the elevated ends of a fractured bone (*vinamana*); (16) rubbing the head, ears, etc., or contusing a part all round before it is surgically operated upon (*bhanjana*); (17) probing or stirring the tract formed by an impacted foreign body (*unmathana*); (18) suction as of poisoned blood and milk by horns, or gourd or mouth (*āchusana*); (19) exploring as by an earthworm-shaped probe, the direction of a sinus or the existence of a foreign body in a wound (*eshana*); (20) splitting or dividing as the head, ears, etc. (*dārana*); (21) straightening anything which is bent (*rjukarana*) ; (22) washing as a wound with water (*prakshālana*); (23) blowing as powder into the nose through tubes (*pradhamana*) ; (24) rubbing out as foreign bodies from the eyes, etc. (*pramārjana*).

Sharp Instruments

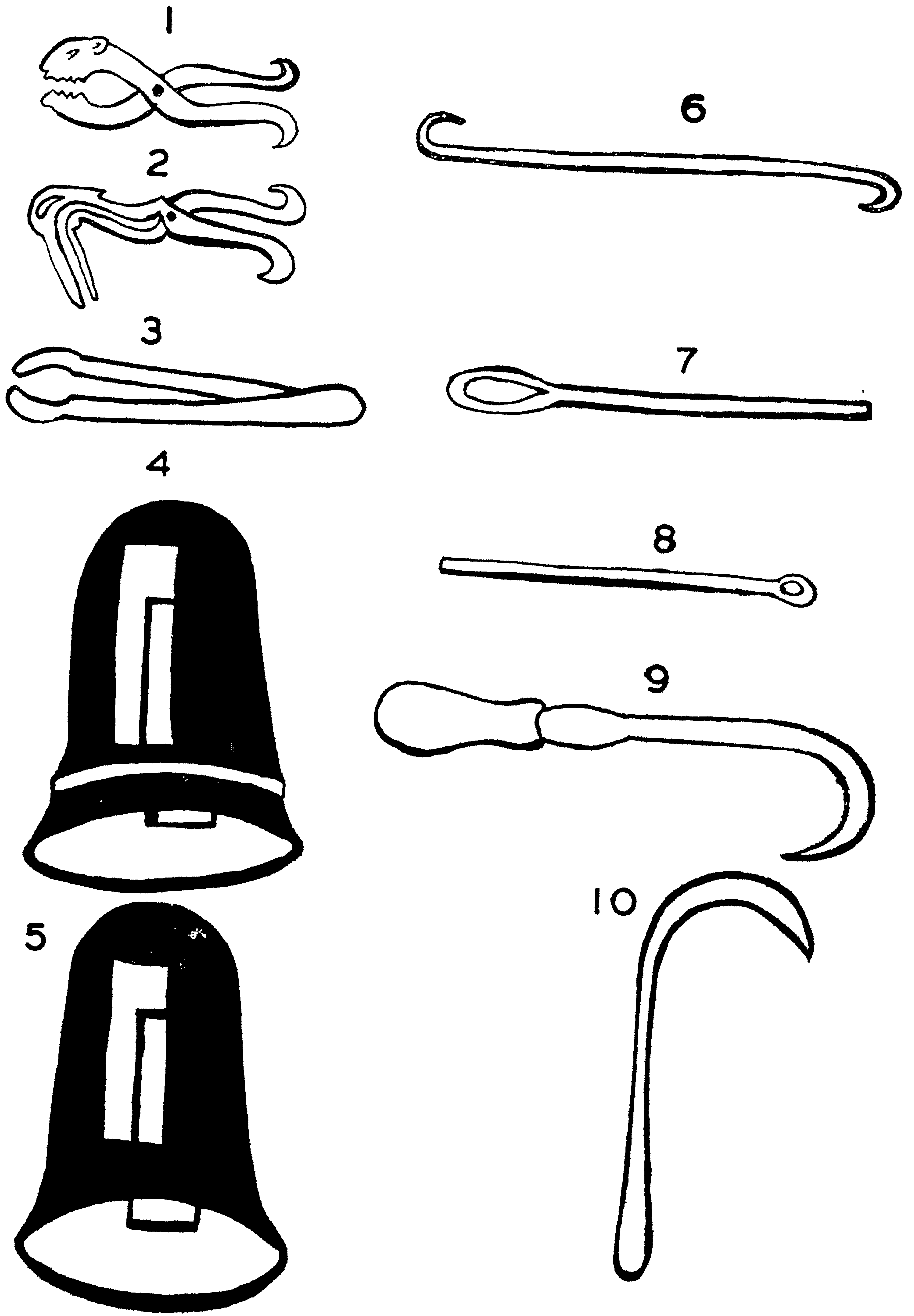
There are twenty sharp instruments. They are : (1) round-headed (*mandalāgra*) ; (2) saw (*karapatra*); (3) razors (*vrddhipatra*) : (4) for cutting nails (*nakhaśastra*); (5) a cutting instrument of the size of the last phalanx of the index finger (*mudrikā*); (6) having the shape of the petal of the water-lily (*utpalapātra*); (7) a knife or lancet with a single edge, the blade being two inches long and the handle six inches (*arddadhāra*) ; (8) needles (*suchi*) ; (9) resembling the blade of *kuśa* grass (*kuśapātra*); (10) shaped like the beak of the *sarah* bird (*ātimukha*) ; (11) scissors (*sararimukha*) ; (12) half-moon shaped, with the cutting edge inside (*antarmukha*) ; (13) a small trocar with three cutting surfaces (*trikurchaka*) ; (14) a small axe-shaped instrument (*kutharika*) ; (15) a small trocar with the head shaped like a grain of paddy (*vrihimukha*) ; (16) a long instrument with the sharp end of the size of a sesamum seed (*ārā*) ; (17) a cutting instrument like the leaf of the *rattan* (*vethasapatra*) ; (18) hook (*vadisa*) ; (19) pincers for extracting teeth (*dantasanka*) ; (20) probes (*esani*).

The *mandalāgra* is used for scraping the membranous part of the pterygium over the sclera and the cornea ; *karapatra* is used for sawing bones ; *vrddhipatra*, *nakhaśastra*, *mudrika*, *utpalapatra* and *arddhadhāra* are used for cutting and puncturing parts ; *suchi*, *kuśa-patra*, *ātimukha*, *sararimukha*, *āntarmukha* and *trikurchaka* are for letting out discharges or opening abscesses, etc. The *kutharika*, *virihimukha*, *ārā* and *vethasapatra* are used for puncturing parts of opening channels ; the *vadisa* and *dantasanka* are used for extracting, the *esani* is for exploring ; the *suchi* (needle) is for sewing.

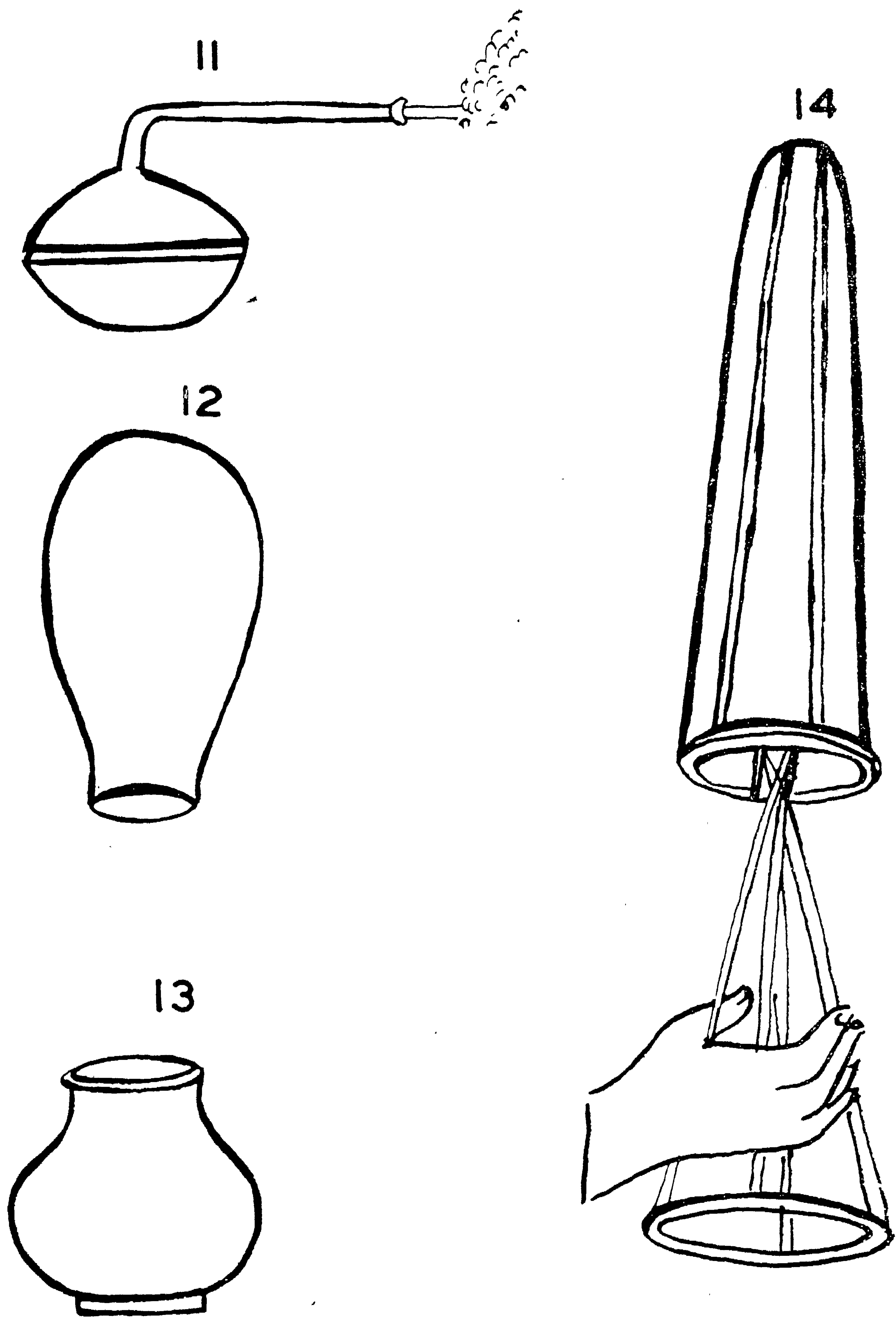
Sharp instruments were used for performing eight kinds of surgical procedures ; (1) excision or removal of a part by the body by operation, as of piles (*chedana*) ; (2) incision of a part, as of an abscess (*bhedana*) ; (3) scarification or dissection of skin flap ; or scraping as of surgical diseases of the throat (*lekhana*) ; (4) puncturing as of blood vessels to bleed patients by instruments having fine points (*vedana* or *vyādhana*) ; (5) probing, as of sinus and fistula by a probe (*esana*) ; (6) extraction as of stone by the spoon or hook (*āharana*) ; (7) to let out pus as from a deep-seated abscess (*vishvāvana*) ; (8) stitching, as of the lips of a wound by needles (*sivana*).[68] Vāgbhata in *Aśtānga Hridya* describes thirteen kinds of operation performed by the sharp instruments.[69]

Directions are clear about holding the instruments correctly.[70] *Vrddhipatra* is to be held at the junction of the handle and the blade ; in fact, all instruments used for incision should be held similarly. *Vrddhipatra* and *mandalāgra*, if used for scarification, should be held with the hand raised a little ; when used for evacuating abscesses, they, as well all as other instruments, should be held by the fore part of the handle. But in the case of children, old, delicate or timid persons, women, kings or princes, abscesses should be evacuated with the *trikurchaka*. *Vrihimukha* is to be held with the thumb and forefinger, its handle being covered within the palm. *Kutharika* is to be held in position with the left hand and struck with the middle finger and then let go forcibly from the under surface of the thumb of the right hand. *Ārā*, *karpatra* and *esani* should be held at their extremities. The other instruments are to be held as required in particular cases. Vāgbhata also gives similar directions.[71]

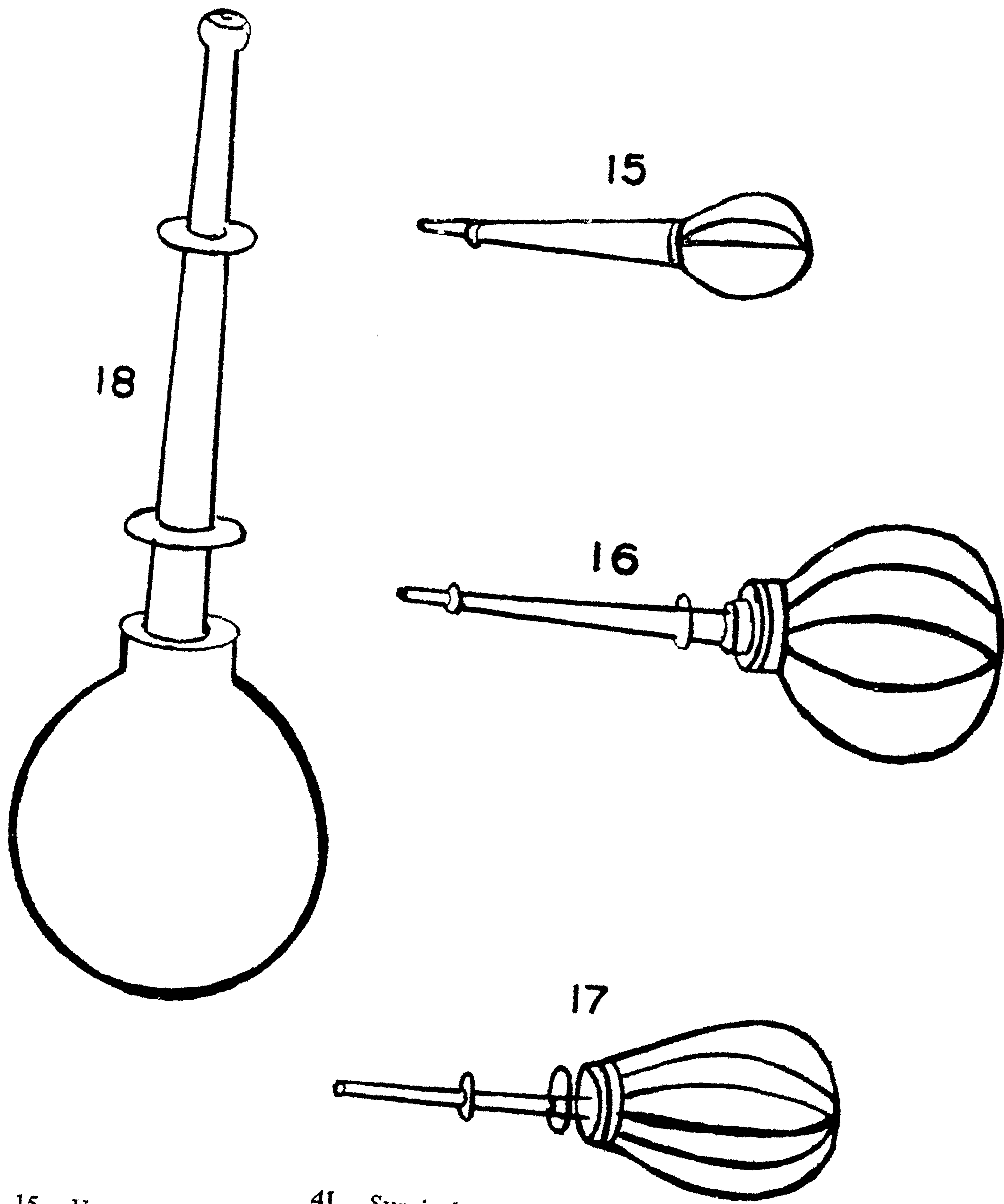
Substitutes used in place of the cutting instruments were: (1) bamboo, (2) crystal, (3) glass, (4) ruby, (5) leeches, (6) fire, (7) caus-



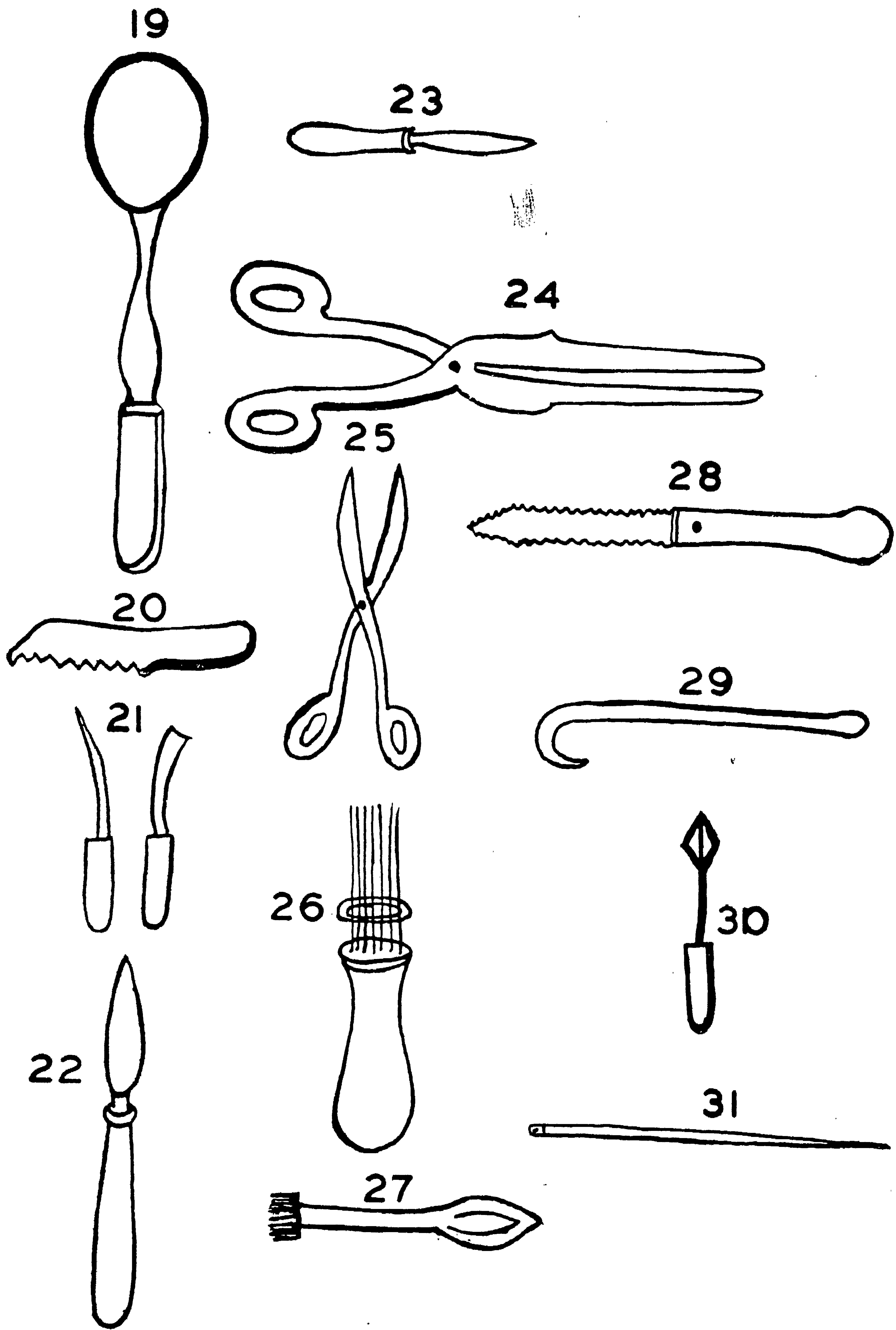
39. Surgical instruments.
1. Simha-mukha Svastika 2. Kanka-mukha Svastika 3. Dvitāla Yantra 4. Arsa Yantra 5. Bhagandara Yantra 6. Vadisa Salā 7. Darbhakrti Khala-mukha Sala 8. Karna Sodnana 9. Garbha Sanku 10. Ardha-chandra-mukha Sala.



40. Surgical instruments.
11. Mallaka Samputa 12. Alābu Yantra 13. Ghati Yantra 14. Yoni Vraneksana.

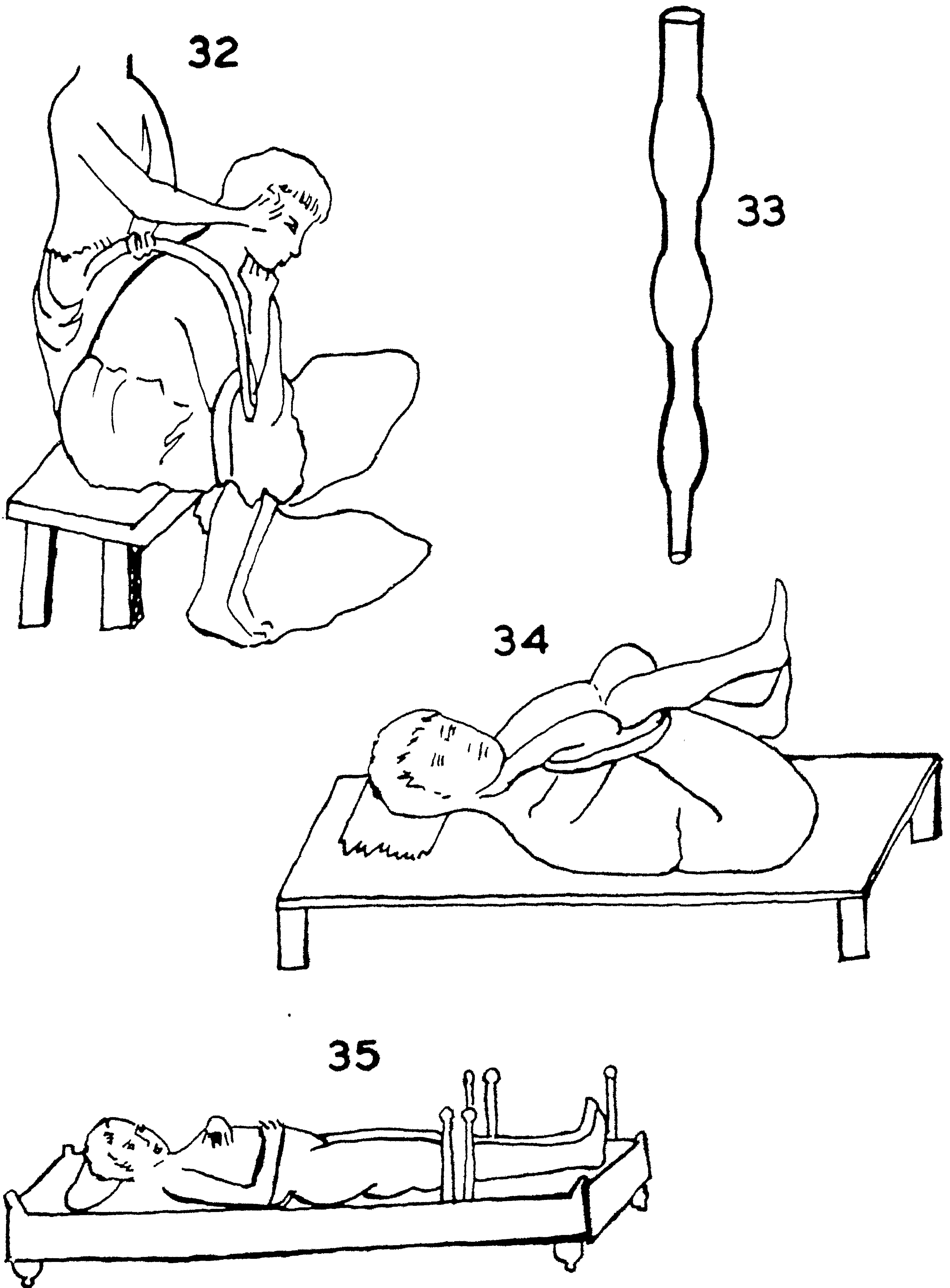


41. Surgical instruments.
15. Vrana Vasti 16. Vasti Yantra 17. Suvasti Yanta 18. Uttara Vasti.

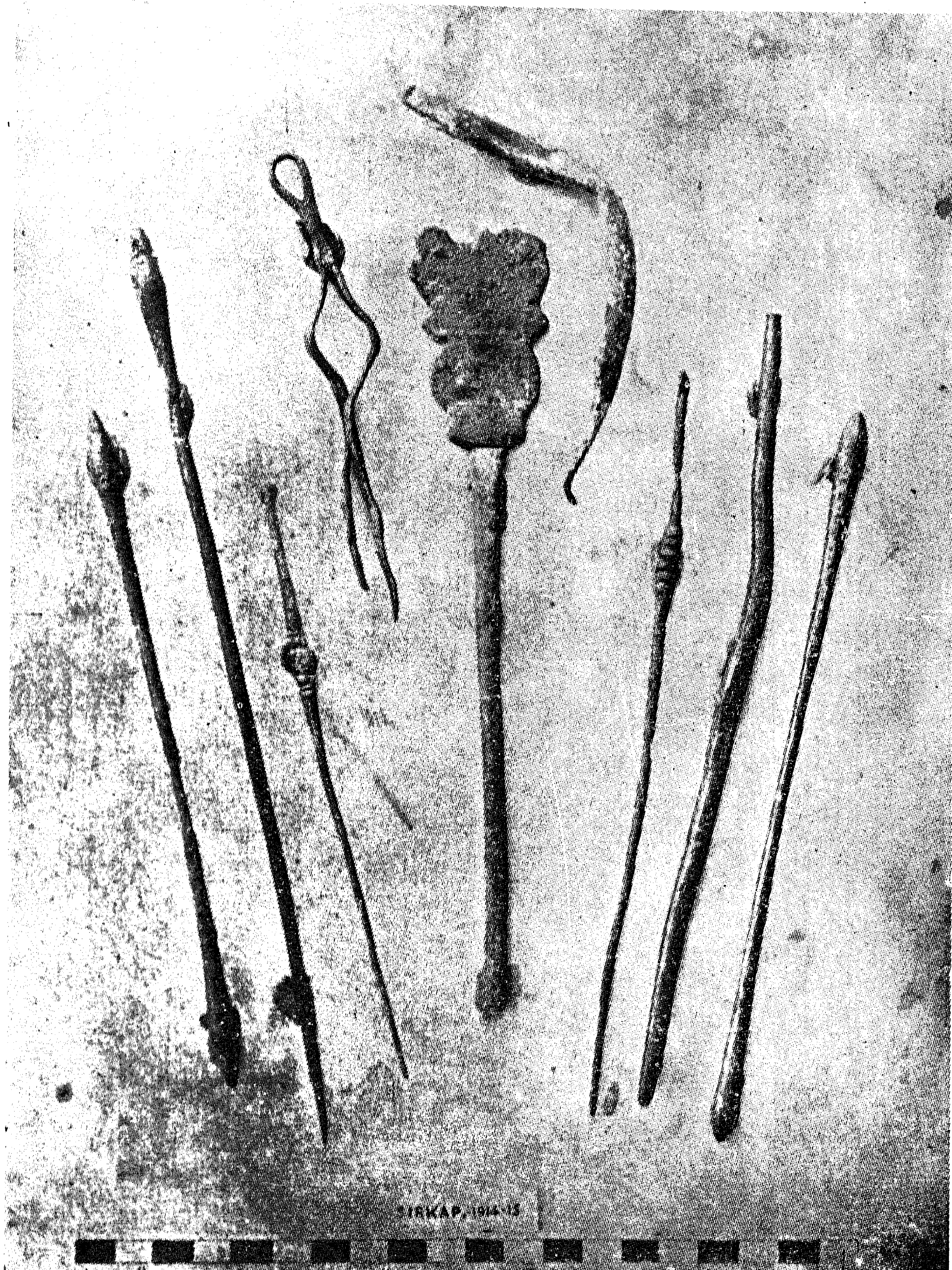


42. Surgical instruments.

19. Mandalāgara Sastra 20. Karapatra 21. Vrddhipatra 22. Utpala patra 23. Kusapatra 24. Sarāri-mukha Sastra 25. Antar-mukha Sastra 26. Kurcca 27. Vrihi-mukha Ṣastra 28. Vetaspatra Sastra 29. Vadisa 30. Danta Sanku 31. Esani.



43. Surgical instruments.
32. Yantra Sātaka for phlebotomy 33. Dhumanādi 34. Yantra Sātaka for lithotomy 35. Fracture immobilization bed.



44. Surgical instruments (Taxila).

tics, (8) nails, (9) leaves of *goji* (*Elephantobus scaber*), (10) *sephalika* (*Nyctanthe arbortristris*), (11) *śākhā* (*Tectona grandis*), (12) young stems of plants, (13) hair, (14) finger. These substitutes were collectively called *Anuśāstra*. The materials of which the instruments were made included iron, copper, tin, lead, gold, silver, horn of animals, bone, ivory, wood, bamboos, stones, etc. Instruments made of metals were properly tempered in three different ways: by immersing the heated instrument in an alkaline solution, or water or oil. Those tempered in an alkaline solution were used for dividing bones and for excising arrows and other foreign bodies. Those tempered in water were used for incising, dividing or clearing muscles; and those tempered in oil were used for puncturing veins and dividing nerves and tendons.[72]

According to the *Suśruta samhitā*, a good instrument should have a well made handle, affording a firm grasp ; it should be made of iron of good quality ; it should have a fine edge, a pleasant shape and a well finished point; and it should not be dented (except the saw). It should be bent, or broken or jagged, or too thick, or too thin, or too long, or too short.[73]

For keeping the instruments in good condition, boxes or covers made of wood, silk, leather or wool were used, each instrument separated from the other.

Writing about the surgical instruments of the ancient Indians, Dr. G.N. Mukhopadhyaya writes: "I could not form any idea as to the shape of some of the surgical instruments from the descriptions given in the text books, and the commentators are silent on those passages. But when I read the accounts of similar instruments in Greek and Roman literature, my difficulties at once cleared up.

"We do not possess any actual specimens of the instruments of the Hindus. Written descriptions of surgical instruments are uninteresting and often fail to convey the true idea, which could be easily made evident by the pencil. For purposes of comparison I have given drawings of instruments of the Greeks, the Romans and the Arabs, when I thought that they might be of value for the proper elucidation of my subject.

"...The drawings of surgical instruments as given by me would look more like the figures in a modern catalogue of surgical instruments. Some of my friends could hardly believe when they saw

the plates that these instruments were known to the ancient Hindus at such an early age. This feeling of amazement and incredulity as regards the surgical instruments used by the ancient Hindus has its parallel in the observations found in the excavations at Pompeii and now preserved in the museum at Naples."[74]

The description of the surgical instruments given in this chapter is based upon the findings of Dr. Mukhopadhyaya.

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10

Toxicology

The effect of poisons, of vegetable and animal origin, on the human body were studied extensively by ancient Indian physicians. They were famous throughout the world for this branch of medicine. The most renowned medical man in the kingdom, i.e., the royal physician used to be an expert toxicologist. One of his main duties was to protect the king against poisoning. He resided inside the palace compound and checked all the dishes served to the king. Whenever the king, with his army, went out to battle, it was the duty of the royal physician to go with the king and to keep a check on the kitchen. He also tested drinking water from tanks and wells to see that it was free of any poisonous matter that might have been mixed by enemy agents.

Detection of Poison : In a chapter entitled *Annarakshaddhyaya* (on the protection of foods), in *Aśtānga Hridya*, Vāgbhata gives clues for detection of poison in different dishes and articles of diet. He states : If raw food is poisoned, it takes a longer time to boil. If cooked food is poisoned, it looks as if it has been preserved overnight and is insipid. Food that is poisoned emits vapours with colours like peacock's feather, and these vapours cause delusion, mental stupor and discharges from mouth and nose. The poisoned food also loses its usual colour, smell etc. and becomes moist and shows spots or circles with display of colours as we find in the peacock's tail. Condiments used in preparing food (*Vyanjanas*), when poisoned, become dry.

If they are in the form of a liquid, they become dirty. In poisoned liquids, reflections appear diminished or exaggerated in size or

deformed, or there may be no reflections at all. On the surface of the poisoned liquid, appear foam, lines, fissures, fibres or bubbles. Drinks, *ragas*, *panakas* lose their taste and the solid and the liquid parts become separated. The lines appearing in different liquid foods, when poisoned, have the following colours: dark-blue in meat juice, coppery-red in milk, dark-brown in curds, reddish-black in butter milk, colour of water in *ghee*, grey in whey, black in sour gruel, wines and water, bright green in honey and slightly red in oils. Unripe fruits, when poisoned, become over-ripe and ripe fruits become putrified. Wet and succulent substances, when poisoned become dry, and dry substances lose their normal colour ; soft and hard substances become respectively hard and soft.

Flowers when poisoned have petals with broken edges and emit an abnormal smell. Clothes, when poisoned, show dirty spots and falling off threads. Metallic substances, pearls, articles made of wood, stones and gems, have a dirty appearance and also lose their radiance or beautiful appearance and coolness or warmth to touch. Articles made of clay acquire an unusual brightness when poisoned.

When poisoned food is thrown into the fire, the fire blazes in the form of a whirlpool, making much cracking noise, and the flames have the colour of a peacock feather, or the fire may emit strong smells without any flame.

Flies die after eating poisoned food ; the voice of a crow becomes weak at the sight of the poisoned food ; parrots, gallinule and *sarikas* (a kind of bird) get excited and scream ; swans stumble in their walk, partridges become weary ; *chakoras* (Greek partridge) lose the colour of their eyes which become pale ; *krauncha* (a kind of curlew) gets intoxicated ; doves, hens and *chakravakas* give up their life ; cats get suddenly excited ; monkeys excrete stools ; peacocks become glad by seeing poisoned food and the power of the poison is diminished.

When poison comes in contact with the skin, itching, sensation of burning by fire or caustics, fever, pain, fissure, numbness and falling of nails and hair, and swelling may result.

If poisoned food is in the mouth, salivation, numbness of the tongue and lips, *usha* (sensation of burning by alkalies), pricking sensation in the mouth, morbid sensitiveness of teeth, paralysis of the tongue or of the jaws may occur.

When the poisoned food reaches the stomach, perspiration, fainting, bloating of the abdomen, giddiness, bristling of the hair of the body, vomiting, burning sensation in the stomach, inactivity of the eyes and mind, appearance of blisters of various colours or of the shape of drops of water on the limbs, are produced.

When the poison reaches *pakvāśaya* (intestines), the affected person vomits materials having different colours, gets excessive micturition and diarrhoea, torpor, paleness, upset of the abdomen, and loss of strength.[1]

The *Charaka samhitā* classified poisonous substances into two main categories : of animal origin, and of vegetable origin. According to it, animal poison causes somnolence, torpor, fatigue, burning, inflammation, goose-flesh, oedema and diarrhoea; on the other hand, vegetable poison causes fever, hiccup, setting the teeth on edge, spasm of the throat, frothy salivation, vomiting, anorexia, dyspnoea and fainting. Animal poison, according to Charaka, affects the lower part of the alimentary tract more ; vegetable poison tends to affect the upper part.[2] Charaka prescribes all sorts of measures including magic and prayers in a case of poisoning ; these include incantations, amulets, excision, compression, suction, cauterization by heat, medicated baths, depletion, emesis, purgation, scalp incision, protection of the heart, eye medication, nasal medication, inhalation, giving linctuses, sedative medications, alkaline applications, counter-poisons, resuscitation, external application of medicaments—a total of twenty four measures.[3]

Snakes and snake bite: The *Suśruta samhitā* excels in the description of snakes, symptoms of snake-bite and the treatment thereof. It classifies eighty different types of snakes into five main categories *viz.*, *dravikara* (hooded), *mandli* (hoodless and painted with circular patches or rings of varied colours on their skin), *rajimān* (hoodless and striped), *nirvisha* (non-venomous or slightly venomous) and *vaikaranja* (hybrid species). The last named is subdivided again as the *darvikara*, *mandali* and *rajimān*.

A person bitten by a *dravikara* snaka (hooded, poisonous), passes through seven different stages of poisoning. In the first stage, the poison vitiates the blood which thereby turns black, imparting this colour to the complexion of the patient; the patient feels a creeping sensation in the body as if ants are creeping over it. In the second

stage, the poison affects the principle of the flesh, turns it deep black and produces swelling (*granthis*) all over the body. In the third stage, it invades the principles of the *medas* (fat) in the body, giving rise to a sort of mucous discharge from the site of the snake-bite, heaviness in the head, perspiration and numbness of the eyes. In the fourth stage, the poison enters the *koshtha* (abdomen) and aggravates the *doṣas*, especially *kapha*, producing sleepiness, water-brash, and a breaking sensation in the joints. In the fifth stage, it penetrates into the principle of bone, deranges the *prāna* (vital breath) and impairs the *agni* (digestive power) giving rise to hiccup, a burning sensation in the body and a breaking pain in the joints. In the sixth stage, it enters the principle of *maja* (marrow) and deranges the *grahni* (the large intestine), giving rise to a sense of heaviness of the limbs, bloody loose motions, pain in the chest and convulsive fits. In the seventh stage, it permeates the principle of semen, aggravates *vāyana*-governing *vāyu*, dislodges the *kapha* even from the minutest channels producing secretion of lump-like phlegm from the mouth, a breaking pain in the waist and the back, impaired function of the mind and of the body, excessive salivation, perspiration and suppression of breath.[4]

Chemical Warfare

Kautilya in his *Arthaśāstra* describes measures to be taken to cause blindness and death among the enemy forces getting ready for a battle. He describes vegetable and animal poisons which, when burnt, produce smoke deadly for the human beings and animals exposed to it. This is one of the first recorded evidences of the use of chemical warfare. Some of the materials he has mentioned in his formulae cannot be recognized properly, yet the description does not become less interesting, through it certainly makes the formulae, probably, less effective when used without adding the unrecognizable materials.

For causing instantaneous death among the enemy forces, some of the formulae he describes are as follows :

The powder (prepared from the carcass) of animals such as *chitra* (?), *bheka* (frog), *kaundinyaka* (?), *krakana* (*Perdix sylvatika*), *panchakushtha* (?) and *stapadi* (centipede); or of animals such as *uchchi-dinga* (crab), *kāmbali* (?) *karkalāsa* (lizard), with the powder of the

bark of *stakanda* (*Phyalis flexousa*); or of animals such as *grahgaulika* (a small house lizard), *andhāhika* (a blind snake), *krakanthaka* (a kind of partridge), *putikita* (a stinking insect), and *gomarika* (?), combined with the juice of *bhallataka* (*Semecarpus anacardium*) and *valgaka* (?); the smoke caused by burning the above powders causes instantaneous death.

Any of the above insects may be heated with a black snake and *priyangu* (panic seed) and reduced to powder; this mixture, when burnt, causes instantaneous death.

The powder prepared from the roots of *dhamārgava* (*Luffa foetida*) and *yathudhana* (?) mixed with the powder of the flower of *phallataka* (*Semecarpus anacardium*) causes, when administered, death in the course of half a month. The root of *vyaghata* (*Casia fistula*) reduced to powder with the flower of *bhallataka* (*Semecarpus anacardium*) mixed with the essence of an insect (*kita*) causes, when administered as much as *kala* (16th of a *tolā*) to men, twice as much to mules and horses, and four times as much to elephants and camels, death in the course of a month.

The smoke caused by burning the powder of *statkardama* (?) *uchchidiga* (crab), *karavira* (*Nerium odorum*), *katutumbi* (a kind of bitter gourd) and fish, together with chaff of the grains of *madana* (?) and *kodrava* (*Paspalam scrobiculatum*) or with the chaff of the seeds of *hastikarna* (castor oil tree) and *palasha* (*Butea frondosa*), destroys animal life, as far as it is carried off by the wind.

The smoke caused by burning the powder made of the mixture of the dung and urine of pigeons, frogs, flesh-eating animals, elephants, men and boars, the chaff and powder of barley mixed with *kaśisa* (green sulphate of iron), rice, the seeds of cotton *kutaja* (*Nerium antidysentericum*) and *kasātake* (*Luffa pentandra*) cow's urine, the root of *bhandi* (*Hydrocotyle asiatica*), the powder of *nimba* (*Nimba meria*), *sigru* (*Hyperanthera morunga*), *phanirjaka* (a kind of *tulasi* plant), *kshibapiluka* (ripe *Coreya arborea*), and *bhanga* (a common intoxicating plant), the skin of a snake and fish, and the powder of the nails and tusk of an elephant, all mixed with the chaff of *madana* and *kodrava* (*Paspalam scrobiculatum*) or with the chaff of the seeds of *hastikarna* (castor oil tree) and *palasha* (*Butea frondosa*), causes instantaneous death wherever the smoke is carried off by the wind.

The formulae as given by Kautilya for causing blindness in the

enemy lines are as follows: The smoke caused by burning the powder of *putikita* (a stinging insect), fish, *kutumbi* (a kind of bitter gourd), the bark of *satakardama* (?) and *indragopa* (the insect cochineal), the powder of *putikita, kshudrarata* (the resin of the plant *Shorea rebusta*), and *hemavidari* (?) mixed with the powder of the hoof and horn of a goat, causes blindness.

The smoke caused by burning the leaves of *putikaranja* (*Guilandina bonducella*), realgar, the seeds of *gunja* (*Abrus precatorius*), the chaff of the seeds of red cotton, *asphota* (*Careya arborea*), *khacha* (salt?) and the dung and urine of a cow, causes blindness.

The smoke caused by burning the skin of a snake, the dung of the cow and the horse, and the head of a blind snake causes blindness.

When a man who has kept his eyes safe with the application of ointment and medicinal water burns, at the commencement of a battle and the assailing of forts, the roots of *kāli* (*Tragia involucrata*), *kushta* (costus), *nada* (a kind of reed) and *satvari* (*Asperagus recemosus*), or the powder of (the skin of) a snake, the tail of a peacock, *kārkana* (a kind of partridge), and *panchakushta* (?), together with the chaff as previously described or with wet or dry chaff, the smoke caused thereby destroys the eyes of all animals.

The ointment prepared by mixing the excretion of *sarika*, *kapota* (pigeon), *baka* (crane), and *bataka* (a kind of small crane), with the milk of *mankashi* (*Hyperanthera morunga*), *piluka* (a species, *Careya arboreya*) and *snuhi* (*euphorbia*), causes blindness and poisons water.

The smoke caused by burning the mixture of the powders of *karkanā* (a kind of partridge), *karkalasa* (lizard), *grhāgaulikā* (a small house lizard) and *audhāhitā* (a blind snake), destroys the eyes and causes madness.

The mixture prepared from the flowers of *bhallataka* (*Semecarpus anacardium*), *yatudhana* (?) *dhamargava* (*Achyranthe aspera* and *bana* (sal tree), mixed with the powder of *elā* (large cardamom), *kakshi* (red aluminious earth), *guggulu* (bdellium), and *hala-hala* (a kind of poison) together with the blood of a goat and man, causes biting madness.

The mixture prepared from the powder of the knot of the tongue of *bhasa* (a bird) and *nakula* (mangoose), reduced to a paste with the milk of a she-donkey, causes both dumbness and deafness.

The (smoke caused burning the) mixture of *karkalasa* and *graga-ulika* causes sores akin to leprosy.

To poison grass and water, the following formula is suggested by Kautilya: The mixture of *yavaka* (a kind of barley), the root of *sala* (*Achyrantes triandria*, the fruit of *madana/dhatura* plant), the leaves of *jati* (nutmeg ?) and the urine of a man, mixed with the powder of the root of *plaksha* (fig tree) and *vidari* (liquorice), as well as the essence of the decoction of *musta* (a kind of poison), *udumbara* (glomerous fig tree), and *kodrava* (*Paspalam scropiculatum*), or with decoction *hastikarna* (castor oil tree), and *palasha* (*Butea frondosa*) is termed the juice of *madana* (*madanayoga*).

The mixture of the powders of *shrngi* (*Atisbetula*), *ganmevrksha* (?), *kantakara* (*Solanum xanthocarpum*) and *mayura padi* (?) the powder of *gunja* seeds (*Abrus precatorius*), *languli* (*Jusseina repens*), *visha-mulika* (?) and *ingudi* (heart pea), and the powder of *karavira* (oleander), *akshipiluka* (*Careya arborea*), *arka* plant, and *mrgamarini* (?) combined with the decoction of *madana* and *kadrava* or with that of *hastikarna* and *palasha*, is termed *madana* mixture (*madanayoga*).

The combination of (the above two) mixtures poisons grass and water when applied to them.

When half a *dharana* of this mixture, together with flour and oil cakes, is thrown into the water of a reservoir measuring a hundred bows in length, it vitiates the whole mass of water ; all the fish swallowing or touching this mixture are poisoned, and whoever drinks or touches this water, will be poisoned.[5]

Whether these formulae are really as effective as they are stated to be by Kautilya, is anybody's guess.

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3. *C.S*, 6. 23. 35-37.
4. *S.S.*, 7. 4. 2-26.
5. *Arthaśāstra*, English translation by R. Shamasastry, 14. 1. 451.

11

Medical Jurisprudence

Kautilya in this *Arthaśāstra* excels in the description of medical jurisprudence. About inheritance and disease, it states: An impotent eldest son is to have only 1/3rd of the special share usually given to the eldest. Eunuchs, idiots, lunatics and blind people have no share in the property. If the idiots have wives with property, their issues who are not idiotic, are to share the inheritance[1].

About Testimony and Disease, it states: Any agreement entered into by a dependent, a minor son, a wife, a cripple, or an afflicted person, shall not be valid. Any agreement shall be void if a person was at the time of making the agreement under anxieties or intoxication or if he was a lunatic or a hunted person.[2] Lepers, persons with other skin eruptions, the blind, the deaf and the dumb were unacceptable as witnesses.

As regards Injury and its Punishment, it states: Causing a bloodless wound with a stick, mud, a stone, an iron bar, or a rope shall be punished with a fine of 24 *panas.* Causing the blood to gush out, excepting bad or diseased blood, shall be punished with double the fine.

Beating a person almost to death without forcing out blood, breaking the hands, legs or teeth, tearing off the ear or the nose, breaking open the flesh of a person except in cases of ulcers or boils, shall be punished with a heavy fine. Causing hurt in the thigh or the neck, wounding the eye or hurting so as to impede eating, speaking, or any other bodily movements, shall not be punished with a fine, but also be made liable (to the sufferer) of such compensation as is necessary to cure him.[3]

Should a person wounded in the fight die within seven nights,

he who caused the wound shall be put to instantaneous death; if the wounded man dies within a fortnight the offender shall be punished with the severest punishment; if the wounded man dies within a month, the offender will be compelled to pay not only a fine of 500 *panas* but also an adequate compensation to the bereaved. A woman who murders a man shall be drowned. Any woman who murders her husband, or her preceptors or cuts off the bodily joints of another woman, shall be torn by bulls. He who hurts the tongue or nose of another shall have his fingers cut off. He who castrates a man, shall have his generative organs cut off.

When a person destroys both the eyes of another, he shall have his eyes destroyed by the application of poisonous ointment or pay a fine of 800 *panas.* Any person who murders his father, mother, brother or teacher shall be put to death by burning both head and skin. If a man or woman under the infatuation of love, anger or other sinful passions, commits or causes to commit suicide by means of ropes, arms or poison, he or she shall be dragged by means of a rope along the public road by the hand of a *chandala.*[4]

As regards causing abortion, it says: If a person causes abortion in a slave by administering medicines, he shall be punished with the severest punishment. If one causes abortion by striking or with medicines or by annoyance, the maximum, the moderate and the mild punishment shall be imposed respectively. A woman murdering her offspring will be torn off by bulls, no matter whether she is big with a child or has not passed a month after giving birth to a child.[5]

The *Arthaśāstra* describes in detail the investigations to be done and the conclusion to be derived at in a case of sudden death. This description occupies a high place in the history of medical jurisprudence. It states: In cases of sudden death, the corpse should first be smeared over with oil and then examined.

Characteristic signs on the dead body that reveal the cause of death are as follows: Any person whose corpse is tainted with mucus and urine, with organs inflated with wind, with hands and legs swollen, with eyes open, and with neck marked with ligatures, may be regarded as having been killed by suffocation and suppression of breathing.

Any person with contracted arms and thighs may be regarded as having been killed by hanging.

Any dead person with swollen hands, legs and belly, with sunken eyes and inflated navel may be regarded as having been killed by hanging.

Any dead person with stiffened rectum and eyes, with tongue bitten between the teeth, and with belly swollen, may be considered as having been killed by drowning.

Any dead person wetted with blood and with limbs wounded and broken, may be regarded as having been killed with sticks or ropes.

Any dead person with fractures and broken limbs, may be regarded as having been thrown down.

Any dead person with dark coloured hands, legs, teeth and nails with loose skin, hair fallen, flesh reduced, and with face smeared over with foam and saliva, may be regarded as having been poisoned.

Any dead person of similar description with marks of bleeding bite, may be considered as having been bitten by serpents and other poisonous creatures.

A dead person, with body spread and dress thrown down after excessive vomiting and purging, may be considered as having been killed by the administration of the juice of the *madana* plant.

Death due to any one of the above causes is sometimes, under the fear of punishment, made to appear as having been brought about by voluntary hanging, by causing marks of ligature round the neck.

Kautilya suggests examination of the undigested contents of the stomach of a dead person. He states : In death due to poisoning, the undigested portion of meal may be examined in milk ; or the same extracted from the belly and thrown on fire. If it makes *chit chit* sound and assumes the rainbow colour, the person be declared as poisoned.

After establishing the cause of death, the question arises who committed the crime. Kautilya gives certain hints: If the belly remains unburnt, although the rest of the body is reduced to ashes, the dead man's servants may be examined as to any violent and cruel treatment they may have received at the hands of the dead. Similarly dead man's relatives such as a person of miserable life, a woman with affections placed elsewhere, or a relative defending some

woman that has been deprived of her inheritance by the dead man, may also be examined.

Causes such as past evils or harm done to others by a dead man, should be enquired into regarding any death due to voluntary hanging.

All kinds of sudden death, centre round one or the other of the following causes : offence to women or kinsmen claiming inheritance, professional competition, hatred against rivals, commerce, guilds and any one of the many legal disputes.

When, owing to false resemblance, one's own's hirelings, or thieves for money, or the enemies of a third person, murder one, the relatives of the deceased should be inquired as follows : who called the deceased ; who was with him ; who accompanied him on his journey ; and who took him to the scene of death ? Those who happen to be at the site of murder, should severally be asked, as follows : by whom was the deceased brought there ; whether they (the witnesses) saw any armed person lurking in the place and showing signs of a troubled appearance ?

After examining the personal property, such as travelling requisites, dress, jewels, or other things which the deceased had on his body when murdered, such persons as supplied or had something to do with those things should be examined about associates, residence, cause of journey, profession and other calls of the deceased.

Suicide, in Kautilya's times, was considered a sin, which deprived even the dead body, of certain religious rites in its disposal. Kautilya states : If a man or woman under the infatuation of love, anger or other sinful passions commits or causes to commit suicide by means of ropes, arms or poison, he or she shall be dragged by means of a rope along the public road by the hands of a *chandala.* For such murderers as above, neither cremation rites nor any obsequies usually performed by relatives should be observed. Any relative who performs funeral rites to such wretches, shall either himself be deprived of his own funeral or be abandoned by his kith and kin. Whoever associates himself with such persons performing forbidden rites, with his other associates, if any, forfeit within a year the privileges of conducting or superintending a sacrifice, teaching, and giving or receiving gifts.[6]

References

1. *Arthaśāstra*, 3. 5.
2. *Ibid*, 3. 1.
3. *Ibid*, 4. 2.
4. *Ibid*, 4. 2.
5. *Ibid*, 4. 2.
6. *Ibid*, 4. 7.

12

Veterinary Medicine

The animals received proper medical care in ancient India. Being man's best friend in normal times and in adversity, the society owed it to them. People depended on cattle for milk, wool, hide, and agriculture. In the battle field, victory depended more upon the superior force of the elephants and the horses.

No wonder not only the physicians but also the kings and the princes were well-versed in veterinary sciences. King Nala had a surname Aśvavit, i.e., one who is well-versed in the science and care of the horses. Nakula and Sahadeva, the twin sons of Madri, were taught by Drona, the art of curing, training and managing horses and cattle. To Nakula is ascribed the work called *Aśva-chikitsā* which is still extant. King Romapada, the contemporary of Daśaratha of Ayodhya, is known to have learned *Gajāyurveda* or *Hasti Āyurveda*, meaning the treatment of elephants, from the sage Palakapya.

During those days physicians treating human beings were also trained to take care of animals. Indian medical treatises like that of *Charaka, Suśruta* and *Harita saṃhitā* contain chapters or references about the care of diseased as well as healthy animals. There were, however, physicians who specialised only in the care of animals or in one class of animals only; the greatest of them all was Śalihotra, the father of veterinary science.

Salihotra

Śalihotra is described as the son of a Brāhmin sage, Hayagosha. He is said to have lived in Srāvasti (modern Sahet-Mahet) on the borders of Gonda and Bahraich districts in Uttar Pradesh. Some

other sources describe Śalihotra as having lived in Śalatur, a place near Kandahar. Śalihotra and Agniveṣa are described as the pupils of the same teacher; others say that Suśruta was Śalihotra's pupil.

Śalihotra is known to have been a specialist in the treatment of the horses. He composed a treatise called *Haya-Āyurveda* or *Turangama-śāstra* or *Śalihotra samhitā*, a work on the care and treatment of the horses. True to the Indian tradition, the knowledge embodied in *Haya-Āyurveda* is also said to have been revealed to Śalihotra by Brāhma himself, the fountain-head of all knowledge. Two other works, namely *Aśvapraśnsa* and *Aśvalaksana śāstram,* are also attributed to Śalihotra.[1]

Haya-Ayurveda

The *Haya-Āyurveda* is a big treatise consisting of 12,000 verses. Only a part of the text is extant. It is divided into eight parts and each part deals essentially with one aspect of the subject. The first part describes the nature, inherent qualities, pedigree, colour, four races of horses, signs of different races, finding the age, examination and names of different parts and different measurements ; measures to improve the horses' body, management of unruly horses, horses fit for the kings and how to purchase them. The second part describes methods of diagnosis and various diseases such as lameness, eye trouble, fever, colic and its varieties, diarrhoea, dysentery, prolapse of the rectum, hiccup, asthma, cough, running of the nose, jaundice, fainting, worms in the intestine, haemorrhage from internal organs, swelling of the legs, symptoms and treatment of snake-bite, poisoning and wounds caused by poisoned arrows.

The third part describes the formation of the embryo, development of different parts of the foetus in the uterus, management of difficult labour due to mal-presentation, different diseases of the reproductive organs, and retention of urine. The fourth part deals with treatment of the diseases of the mouth and the tongue in which the horse is unable to eat, and treatment of flatulence and diarrhoea. The fifth part starts with the influence of different planets on horses and then describes fevers, skin diseases, and fractures of the bones. The sixth part also deals with the evil influence of the nine *grahas* on the horses and tells how to expiate for them. The seventh part describes different complications of the treatment ; it deals with

diseases caused by the use of some articles of diet such as milk, wine, salt, and the complications caused by the use of tubular instruments for enema.

The eighth and the last part deals with, what it calls, mysterious topics ; it describes various lines on the horse's body and their significance ; the duration of life ; signs of death caused by evil influence of the stars ; preparation of various remedies for administration to the horses, such as myrobalan, garlic, guggulu, mustard, lac, *triphala*, resin and remedies to prolong life. It also deals with the training of horses, weights to be carried by them, methods of yoking horses to a chariot, and management of the stables.

The *Haya-Āyurveda* was accepted as a standard work on the subject in ancient times. Some chapters of it have been quoted in *Āgni Pūrana* and *Matsya* and *Garuda Pūranas* also refer to this treatise. It was, perhaps, redacted by Kalhana in the twelfth century A.D., under the title *Śālihotra-samuchchaya*. This work of Śalihotra was also translated into Persian, Arabic, Tibetan and English.

Other important editions or redactions of this work are *Aśvavaidyaka* by Jayadattasuri and *Aśvaśāstra* or *Aśva-chikitsā* by Nakula. *Aśvavaidyaka* is a large volume of 68 chapters dealing with many topics, including separate chapters on different breed of horses, their characteristics according to age, sex and breed; the features to be desired and preferred in horses for riding, for drawing carriages, and for stud purposes; foaling, lactation, diet, various types of internal medicines and external applications for equine diseases like cough, indigestion, diarrhoea, apoplexy, madness, etc; and surgical operations for treatment of malformations, diseased condition, etc. The medical and surgical methods follow precepts of Āyurveda.

The *Aśvaśāstra* is remarkable for its coloured illustration of the anatomy of the horse. It is also a valuable treatise on many aspects of knowledge relating to horses. An Āyurvedic lexicon, also credited to Nakula, named *Chikitsā Samgraha*, contains a glossary of terms and materia-medica relating to this branch of knowledge. Bhojaraja's encyclopaedia quotes also passages from *Hayalilavatinama samgraha*, by Jayadeva *Vājichikitsā Samgrahā* by Jayadatta, and *Sarasamgraha*, an anthology of different works on this subject by Nakula.

Hasti-Ayurveda

Veterinary science related to the elephants was quite advanced in ancient India. It had to be so because the elephant was a rare and expensive animal, and also useful in many ways.

Pālakapya, son of Samagayankha, is said to have composed a treatise *Hasti-Āyurveda* or *Pālakapya samhitā*.[3] It is divided into four sections and 152 chapters. It contains more than 10,000 verses or 20,000 lines and is almost as big as the *Charaka samhitā*. It gives detailed information about the anatomy, physiology and pathology of the diseases, their surgical and medical treatment, and care and diet of the elephants.

The treatise begins by describing the mythological origin of *Hasti-Āyurveda*. Section One entitled 'Major Diseases' describes smearing of oil and *ghee*, and bathing in water; time and measure of feeding elephants with rice and treacle; time of giving them solid and liquid food and their quantity; causes of fifteen kinds of death of wild elephants; natural food of the elephants : leaves of trees and grasses; *initiation* of the disciples; diseases and their classification; fevers in elephants and other diseases.

Section Two describes minor diseases; vomiting, diarrhoea, fainting, poisons that derange the system of the elephants, signs and symptoms of poisoning; arrows; snake-bite; boils; influence of planets; elephants agitated by mental disorders; farcy; emaciation; increase of *vata*, *pitta* and *kapha*; purification of mouth of elephants by the natural food of the forest; wounds on the planter surface of the feet of elephants; signs of thirsty elephants; prickly tongue of elephants; supernatural possessions: insanity and its treatment; eating worms which live on leaves; inflammation of lungs; inflammation of scrotum; warts and foot diseases; treatment of old age in elephants; tired elephants; digestive diseases; care and treatment of young elephants; retention of urine, fever after delivery; diseases of the teeth; mental derangement caused by fear; colicly pain; difficulty in drinking fluids; bites of the honey-bees; skin diseases; diseases caused by eating earth; diarrhoea; dysentery; worms in the hair and ears; diseases of the ears; loss of appetite; inflammation of chest; tumours of five kinds.

Section Three deals mostly the surgical aspects. It describes signs and symptoms of fresh wounds caused by lions and tigers and

their treatment; ulcers; pregnancy; venesection; vital points (*marmas*); bite of mad dogs; instruments and method of using them; caustics; fractures; difficult labour; extraction of teeth in elephants.

Section Four is a supplement (*uttrasthāna*). It describes oleaginous medicines, their administration and dosage: food and proper way of giving it; enemas; stables; their soil, size and construction; snuffs; grass as food; prognostications; kinds of artificial food preparations for the elephants to make them fit for war; fight with other animals; the mode of feeding elephants with sugar-cane; giving snuffs; types and methods of giving collyrium; nursing elephants in the first year; good and bad effects of giving wine to elephants: how to know that the elephant has been sufficiently oiled, medicated and sweated; urine and faeces of cow, buffalo and elephants: use of medicated *ghee*; leeches; ceremonies when an elephant dies.[4]

A treatise dealing exclusively with *Gavāyuruveda* (medical knowledge concerning bovine animals) attributed to Gotama, must have been current up to the middle ages, as quotations from it are found in the *Rājamārtanda*, but no authentic version is known at the present time. This treatise contained informations relating to mating, stud bulls, calving, possible retention of placenta, lactation, sources of contamination of milk and ensuring the best quality of milk, diet in health, diseases, pregnancy, and bovine ailments in the shape of fevers, gastro-intestinal troubles, skin affections, ulceration of udders, loss of milk, sterility, etc., and their treatments[5].

The *Rājamārtanda*, medical encyclopaedic work by Bhojaraja contains extracts from earlier veterinary treatises and deals with the behaviour and treatment of buffalos, deer, dogs, falcons, pigeons, etc. The *Yogasudhānidhi* by Vandimisra contains a chapter on conception, obstetrics and special diseases of female animals.[6]"[7]

Ashoka opened hospitals for animals. *Arthaśāstra* on Kautilya refers to the position of superintendent of horses and elephants, and his duties.

All the above-stated treatises on treatment of the diseases of the horses, elephants and other animals are based upon the fundamental concept of Āyurveda. Even diseases of the plants were treated according to Āyurvedic principles. A chapter in *Śivatatvaratnakara* states the following with regard to the diseases in plants.

"The (health and) disease in plants, as in human beings, are

based on their respective (normality and the abnormality of the function of) *vāyu*, *pitta* and *kapha*. Therefore the *doṣic* abnormalities should be removed. Whether tall or short, when a tree exhibits the characteristics of leanness, dryness, sleeplessness and subnormal sensibility, and is deficient in bearing flowers and fruit, its constitution is *vatic*. Again, if the plant cannot tolerate the heat of the sun, is pale, deficient in branches, prone to ripen before time, it is *pattaic* in nature. A plant which has fully developed with a heavy stem and branches is resplendent with flowers and fruit, has a large girth and is covered with creepers, is of *kaphaic* constitution".[8]

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4. Ibid, vol. 20, p. 424.
5. Majumdar, R.C., in *A Concise History of Science in India*, p. 254.
6. *Rajamartanda*, Ayurveda Granthamala Series.
7. Majumdar, R. C., in *A Concise History of Science in India*, p. 254.
8. *Śivatattva-ratnakara*, verses from *Vriksha Āyurveda*, quoted from *Āyurvedic Medicine : Past and Present* by Shiv Sharma, p. 10, 1971

13

Opinion of the Foreigners about Indian Medicine

Alexander invaded the north-western frontier of India in B.C. 326. He had with him a team of his own physicians and scholars who observed Indian physicians at work, and exchanged notes with them. Records have it that Alexander formed a high opinion about the achievements of Indian physicians, particularly their expertise in the field of toxicology and treatment of snake-bites.

This is further confirmed by the observations of Megasthenes, Seleucos' ambassador in the court of Pataliputra.

The Buddhist pilgrim, I-Tsing, came to India in the year 673 A.D. He travelled in India and remained here till 695 A.D. Though a Buddhist monk, he had some knowledge of medicine. In India he lived amidst monks and observed their daily routine. According to him, the monks observed strict hygienic rules about eating and drinking, bathing and brushing their teeth.

The first Arabic treatise on medicine containing a section on Indian Medicine is *Fardaus-u'l Hikmat* (The Paradise of Wisdom) composed between 830-838 A.D. by a Persian Abul Hasan Alib Sahl Rabban-al-Tabari. Rabban-al-Tabari was (born about 810 A.D. at Merv) a famous physician and had settled down at Baghdad.

The Fardaus-u'l Hikmat describes different aspects of Indian medicine and practice. Some of the teachings, habits, beliefs and traditions of the Indians mentioned in it throw light on the social life and beliefs of the people. It states : "They (Indians) say an intelligent man should cultivate habits which will benefit him in his present and

after life. One of these is that he should not believe a woman and should not allow her to use any of his powers. He should not cultivate acquaintance with those who do not praise his mode of life and his religion. He should not enter into the house of sinners and the one in which unlawful things are taking place. He should not enter into the houses of men whom the king sends for. He should not stretch his legs in a meeting and he should not lower his face towards the chest while speaking.

"He should neither halt in a dangerous place nor should he settle down in such a country where the following four things are not to be found : namely, a just king, a learned physician, running water, and medicines. One should not reside in a country which is pillaged by kings, or one which is full of diseases and has no fruits and goodness. He should not eat, sleep or carry sexual intercourse at the time of sunrise and sunset.

"One should not sleep in a wet place because it causes sickness. One should not travel in the dark of the night, unless he has with him a lamp, a walking stick, a turban (on his head) and a friend he can rely upon. One should not spit around a place of prayer. One should not be deceived in travelling or getting down from a ride with difficulty which may hurt him. One should not sit at an intersection of many roads.

"One should not always read books because it hurts the senses (sight) and makes a man sick. One should sit only in a sitting place. Parents, relatives, guests and the teachers should be given due respect. Holy and religious men should be honoured. Neither costly stones nor medicines which are used for breaking the power of witchcraft and poison should be separated from him, because he does not know when he will need them. One should not wear either mean or showy dresses (it should be moderate). One should be forgiving, respectful, kind, generous and aloof from wickedness and wicked people.

"One should not earn one's livelihood by means of unworthy arts. He should not tell his secret except to those whom he can rely upon. Complaints should not be made to people too often, because it makes his foe feel happy and bold, but grieves his friend. One should meet everyone who loves to be met. What he likes to have for his self, he should like to have it for his relatives and friends ; for,

if he did not share them those good things which he has, they will despise him. It is to be borne in mind that the roots of all sins are the ten habits which are committed by hand, tongue, and mind : those that are done by hand are murder and theft ; those that are performed by the tongue are back-biting lying, laughing at others, abusing and giving false evidence ; and those that are committed by the mind are unbelief in God, jealousy, enmity and unhealthy thoughts. One should guard oneself from all these things and be away from those who are apt to commit them.

"He should not turn away a beggar if he asks for something. He should give him something, be it a date or a loaf of bread. One should not harm or abuse the person on account of whom some calamity befell him. One should not think too much of oneself due to one's knowledge and strength. He should refrain from disobedience at the time of downfall (where he is in subordinate position), from fear in the time of peace, from haughtiness in prosperity and from (too much) humility when occupying an exalted position. He should not show his pride to others, because pride and greatness are suitable for God alone.

"If you find a man is favoured by a gift of God, you just find out the path adopted. Then you pray God by that means to bestow His gift on you. Unless you are forced to speak, you should not carry a weight more than your strength can endure. Do not waste your energy except for these three, namely : to do good deeds to be rewarded in the next world, to earn livelihood without committing sins, and for the appeasement of desire by lawful means. You should neither be proud of the wordly riches which you possess, nor should you be grieved at what you have lost in it, because life in this world is very short and the exit from it is at hand (near). Everything of this world is (like) a dream and an illusion."[1]

The first hint from a foreign visitor to India stating that all was not well with the Indian sciences came from Alberuni, in the year 1031. He had read much about India and had come and stayed in the Punjab for some time. About the Indian sciences he said : "The number of sciences is great, but it may be still greater if the public mind is directed towards them at such time as they are in the ascendancy and in general favour with all, when people not only honour science itself but also its representatives. To do this, is in the

first instance, the study of those who rule over them—of kings and princes. For they alone could free the minds of scholars from the daily anxieties for the necessities of life, and stimulate their energies to earn more fame and favour, the yearning for which is the pith and marrow of human nature.

"The present times, however, are not of this kind. They are the very opposite, and, therefore, it is quite impossible that a new science or any new kind of research should arise in our days. What we have of science in nothing but the scanty remains of bygone better times."

Alberuni also mentioned the causes of such a state of affairs. He said : "Hindus believe that there is no country but theirs, no nation like theirs, no king like theirs, no religion like theirs, no science like theirs. They are haughty, foolish, vain, self-conceited, and stolid. They are by nature niggardly in communicating that which they know and they take the greatest possible care to withhold it from men of another caste among their own people, still much more, of course, from any foreigner. According to their belief, there is no country on earth but theirs, no created beings beside them have any knowledge of science whatsoever. Their haughtiness is such that, if you tell them of any science or scholar in Khurasan and Persia, they will think you to be both an ignoramus and a liar. If they travelled and mixed with other nations, they would soon change their mind, for their ancestors were not as narrow-minded as the present generation is."

Some of the later Indian Muslims wrote books either exclusively on Indian Medicine, or described it in their more comprehensive texts. They wrote about Indian Medicine so as to make the readers familiar with it, as it was more applicable to the Indian environment than was the Greek System of Medicine. The earliest book on Medicine written in Persian in India is *Madnul-shifa-i-Shahi* or Sikandar Shah's Mine of Medicine. It was composed in 1512 A.D. by Mian Bhowa. It is based on more than a dozen authoritative Indian medical works, and was dedicated to Sultan Sikandar Lodi.

In the Introduction to this book, the author states : "It has been learnt by experience that the Greek System of Medicine does not suit people of India, nor does it agree with the climate of this

country. And as the name of the medicaments are mentioned in the Persian and Greek languages, they cannot be identified in these lands and many of them are not even available in this country. It is, therefore, necessary to make a thorough study of the books of the Indian physicians, which serve as magnate for the diseases of the bodies as well as for the defects or temperament......"[2]

Mian Bhowa put together in this book extracts from the medical works according to him of (1) Suśruta, (2) Charaka, (3) Gatu Karna, (4) Bhota, (5, 6) Vag Bhata, (7) Rasa Ratanākara, (8) Sarangadhāra, (9) Banga Sena, (10) Chinta Manıd, (11) Madhāva Nidāna, (12) Chakra Dutta (13) Gaya Duttā (Gaya Dasā ?) and others which were in use and were tested by experience.

Another similar book was compiled by Ferishta (Mohammed Qasim), the famous historian, in the year 1590 under the patronage of Ibrahim Lodi Shah II. His book is entitled *Dasturu 'I Atibba* or *Ikhtiyarati-Qasimi*. Here also the Introduction is in tune with that of Mian Bhowa. It states :

"The writer of these pages Mohammed Qasim entitled Hindushah, commonly known as Ferishta, studied the noble science of medicine as deeply as possible and spent a part of his valuable life on it. After the perusal of the books on the subject commonly used in Iran, Turkey and Arabia, he turned towards the study of Indian physicians. He found their theories as well as their practice of medical science extremely well founded. He, therefore, thought it necessary to compile a book dealing with their medical principles and their application and with their system of treatment of diseases which at the outset appeared to be strange. For there were many Muslim friends living in this country who had no thorough knowledge of the ever-changing climate of this country nor were they well aware of the systems of treatment followed by Indian physicians. In this book, therefore, he mentioned the properties of the drugs and of the victuals and their names which were difficult to pronounce. Thereby, he also wanted to leave behind something for which he might be remembered"[3].

After these two books on Indian Medicine written in Persian, many such books were written either on a part or the whole of the Indian System of Medicine, and they proved popular.[4'5]

During the sixteenth century and afterwards, many Europeans

visited India, for trade, for the spread of Christianity, or as adventurous tourists. Some of them stayed in India for years and wrote about their experiences in this country. These accounts contain topics of medical interest also, and describe the practice of medicine by Indian physicians. These accounts may lack the whole truth because of the limited observations the European could possibly make and the bias they could have against a thing about which they could not be very well informed, yet they do give us some idea, or at least, the opinion of these people, about the things they observed. From this last point of view, these accounts are certainly important.

Garcia da Orta is the earliest of the European scholar-physicians who practised medicine in India and wrote a book on the *Simples and Drugs of India.* He was born about 1490, at Elwas in Portugal near the Spanish border. He studied in the Spanish universities of Salamanca and Alcala from 1515 to 1526. He sailed to India in 1534 as a physician with Alfonzo de Souza, who later became Governor of Portuguese India. Orta became well acquainted with the kingdoms and people in the west coast of India. Later, as physician to the Viceroy of Goa, Orta had a house and a garden with medicinal herbs in the Portuguese capital.

Garcia da Orta was the first to describe the Indian plant, *Rauwalfia serpentina.* His book *Simples and Drugs of India* was first published in Goa by Jahannes De Endem in April 1563. Many editions of it appeared later. In his book, he wrote : "I come to India with the great desire to know about the medicinal drugs and other medicines of this country... I also desire how the native physicians use them." Then he described, in fifty chapters, different vegetable and non-vegetable drugs, precious stones, etc.

Francois Bernier, a French physician, came to India towards the end of 1658 or the beginning of 1659, and landed at Surat. He stayed at various places in India, including Ahmedabad, Lahore, Kashmir, Kasimbazar, Masulipatam, Golkonda, etc. He was in the Moghul court for many years and treated many *umrahs* (chiefs). His voluminous work *Travels in the Mughal Empire*, describes the state of medicine and health of people in India. In his book, he states : "Of physic (medicine) they have a great number of small books which are rather collection of recipes than regular treatises. It is not surprising that the Gentiles understand nothing of anatomy."[6]

Manucci Niccolao, Viennese physician, came to India and lived here between the years 1653-1708. He has given an account of replacement of a damaged nose by Indian physicians in his voluminous treatise *Mogul India.* He said "...At the commencement of the war (A.D. 1670) when the men of Bijapur caught any unhappy persons belonging to the Moguls who had gone out to cut grass, or collect straw or do some other service, they did not kill them but cut off their noses. Thus they came back into the camp bleeding. The surgeons belonging to the country, cut the skin of the forehead above the eyebrows and made it fall down over the wound on the nose. Then giving it a twist so that the live flesh might meet the rather live surface, by healing applications, they fashioned for them other imperfect noses. There is left above between the eyebrows a small hole, caused by the twist given to the skin to bring the two live surfaces together. In a short time, the wounds heal up, some obstacle being placed beneath to allow of respiration. I saw many persons with such noses, and they were not so disfigured as they would have been without any nose at all, but they bore between the eyebrows the mark of the incision."[7]

A French national named Charles Dellon came to India in 1668. He was only nineteen then. He worked in the Navy and then in the factories of the French East India Company. In 1673 he left the Company's service, and started medical practice at Daman, a Portuguese territory. After a stay for five to six months there, he was arrested and taken to Goa where he was kept in prison for two years. In January, 1676, he was taken to Lisbon and was set free in June. He then went back to France, his country of birth. There he settled and wrote of his experiences in India in the form of two books. In *Voyage to the East Indies,* Dellon described Āyurvedic physicians, their methods of treatment and the health conditions in India. About the Āyurvedic physicians, he wrote : "The pagan physicians, whom they called pandits, are a sort of people without learning or any knowledge of insight into anatomy. All their skill is confined to a certain number of recipes which they have received by tradition from their ancestors."

Writing about the treatment of common fevers by Āyurvedic physicians, he stated : "They never allow their patients afflicted with any kind of fever in the Indies, neither meat, neither eggs or bread;

his would be as much as patient's life is worth, if they should give them any of these things. They allow them no other drink but fair water, and for the rest of their sustenance, they give them a rice water (*cange*) which is made in the following manner : they beat about half a pound of rice into two or three quarter of water, which they boil so long, till the rice be well broken, which is commonly done in an hour's time. They then strain it through a linen cloth, and squeeze it well to draw out all the goodness from the rice ; of this they give a spoonful at a time, four or five times a day to a patient, making it always warm, and putting a little salt into it, to make it the more savory.

"The *cange*, besides that it nourishes well, serves also to quench the thirst ; I must confess I prefer this much before our jelly broths, it coming much nearer to the diets prescribed by the ancient physicians in these cases then what is used now-a-days in France, rather by the connivance than the approbation of the physicians.

"For, is it not very strange to see a sick body to take more nourishment, whilst he is sick, than perhaps he used to do when he was in health ? It being beyond all question, that jelly broth taken perhaps seven or eight times a day and new-laid eggs, which we give our patients, contained more nourishment and produce a greater quantity of pure chyle than a moderate quantity of bread and meat, which is the ordinary food of people, when they are in good health.

"Besides this, the *cange* has also this excellency that it causes no aversion in the patient, which is the general inconvenience in these strong broths which being taken with so much repugnancy, can scarcely be supposed to produce any good effect.

"If it be a continual fever, they allow them nothing else but *cange*, but if it be a tertian ague, they allow them betwixt the fits, to eat a little bread and sweetmeats, but no kind of meat or eggs, unless it be after the ague has entirely left them and there is no fear of a relapse."

Dellon also described the procedure of blood-letting by the Āyurvedic physicians in different diseases. He stated : "Letting of blood is much used among the Indians and that with good success ; the pandits, being by long experience, convinced of the usefulness of this remedy, will sometimes, let blood twenty times one after another, without the least reluctancy to be observed in the patient,

who never grumble here at what their physicians do, but are exactly observant to their orders, much beyond what is practised in most parts of Europe, where the patient, their friends and the nurses propose their own remedies, before the physician's prescription.

"They let blood most commonly in the foot with extraordinary good success ; and I have made these observations, not only in the Indies, but also in all other places which I have visited in my travels, as well as in France, that there are few distempers, where the letting of blood in the foot proves not more successful than what done in the arm.

"The Indians prescribe cupping and leeches in those distempers where they dont's think it proper to let blood."

About different enema preparations, Dellon wrote : "Clysters are also much in use among them ; they are composed of senna, cassia and tamarinds and so are their purges, which have the same effect, only by two different ways ; they mix therein some syrups of simples, to wit, of cichory, roses, lemons and maiden hair."

About the unfamiliarity of the Indian physicians with chemical preparations, he wrote : "Chemical preparations are unknown to the pundits ; they are surprised when they see us produce such evacuations as we do, by the help of such small quantity of medicinals."

Giving his experiences about the treatment of cases of fever with delirium, he wrote : "The pandits perceiving the urine of the patient that is afflicted with a fever to be white, they judge it to proceed from a cold cause, without having the least respect to the delirium and other symptoms which are ordinary signs of this urine.

"For which purpose they put pepper in the *cange*, which they apply to the patient's head to warm the brains, which, they say, are too cold, and for the same reason it is, that they will not let blood in such a case, before they find urine to be of a high colour.

"I have quite often observed, that of all those that ever I saw, were seized with a delirium before they were let blood, and whose urine appeared thus white in the beginning, very few escaped with life, unless by good fortune they happened to light into the hands of some European physicians who are better acquainted with the true cause of the distemper and its symptoms, of which I cannot forbear to give you an instance."[8]

John Marshall, an Englishman, came to India in 1668, and

lived till 1677, at Masulipatam, Patna and Kasimbazaar where he died after a short illness. He wrote a manuscript entitled *Notes and Observations on East India* in which he described in brief, besides other things, some diagnostic methods employed by Āyurvedic physicians. About examination of the pulse, he wrote :

"The Hindoos reckon upon three humours in man's body, viz., *by* (*bai*, air), *pitt* (*pit*, bile), *cuff* (*kafe*, phlegm), which they know by the pulse upon the right hand ; laying one finger near the bottom of the thumb upon the pulse upon the wrist, and that is for *cuff* ; another finger by it nearer the arm and that is for *pitt*; and other nearer the arm and that is for *by*, so that if the pulse under the last finger named beat high, then is the body full of *by* : if under the other, then *pitt* ; if under the other, *cuff*. If all the three beat high, then is the body inclining to a fever ; if low and even, then is little nature (vital power) in a man ; if indifferent high and even, then in good health, if have good stomach."

About urine examination, as a method of diagnosis, he wrote : "In the early morning, let a man make water into a glass or pot, but let a little at the first go from him upon the ground, and let him not piss so long as he can into the glass, but at the latter end piss again upon the ground ; so that he hath in the glass the piss that in the middle came from him, which let stand till it be cold. Then take some clear oyle, as lamp oyle, and with a strain let fall one drop of it into the piss which oyle if it (sic ? it) keeps together and spreads not or to but little, tis a sign of very good health. If it spreads but breaks not, but keeps together, tis a sign of indifferent health ; if the oyle spread and break into several pieces, it is a sign his distemper is incurable and will at length kill him, though perhaps not very suddenly. But if the oyle sink to the bottom, it is a sign the man will die very suddenly."

John Marshall's observation about the examination of a Muslim woman by the Āyurvedic physicians is as interesting as it is informative. He wrote : "The Hindoo physicians being not permitted to see any of the Moores women, so that when they are sick and desire their assistance, they cause them to take a handkerchief and rub all over their body so that it be well wet or moistened with the sweat of the body, or dirtied therewith. The handkerchief the physician

puts into a basin of fair water and steeps it, and by the smell of the water knows the distemper......"[9]

Proper investigations into Indian Medicine by Western scholars started in the nineteenth century. Even earlier than that, Sir William Jones, towards the end of the eighteenth century, wrote an article on the botanical aspects of Indian Medicine. This was followed by a research paper by H.T. Colebrooke. In the year 1823, H.H. Wilson wrote an article entitled, *On the Medical and Surgical Sciences of the Hindus*. In 1837, J.F. Royle investigated and wrote an article entitled, *The Antiquity and Independent Origin of Hindu Medicine*. Then followed a comprehensive treatise called a *Commentary on the Hindu System of Medicine* by T.A. Wise in 1845. These studies aroused some interest among the Western scholars about Indian Medicine, and during the nineteenth century different authors stated their views on the subject.

Renouard in his *Medicine of the Oriental Indians* (1836), states: "They admit three principal sources of internal diseases, viz., flatulency (*wodum*), vertigo (*bittam*), impure humos (*t'chestum*). They further believe that all cutaneous diseases were caused by worms. According to them, there were in the human body, one hundred thousand parts, of which seventeen thousand were vessels. Each one of these is composed of seven tubes giving passage to ten species of gases, which, by their conflicts, engendered a crowd of diseases. They placed the origin of pulse, in a reservoir situated beneath the umblicus. This reservoir was four fingers wide, by two long, and divided into seventy-two thousand canals, which were distributed to all parts of the body. Upon a physician examining the pulse of a patient he observed at the same time very carefully, his countenance, believing that every change in the pulsation of the artery answered to a corresponding change in the expression of his face. He examined also the faeces and the urine, consulted the stars, the flight of birds, the accidental incidents in his visit; he drew, in a word, his prognosis from a thousand different circumstances, but omitted those which alone could be available to him, namely, the symptoms indicating the state of the organs."[10]

Hermann Bass in his *Outlines of the History of Medicine and the Medical Profession* (1889), sums up Indian Medicine by stating: "We must assign to it, at all events, a superiority over the Egyptian

a continuous development. That it was not far behind Greek medicine, both in the extent of its doctrines and in its internal elaboration, furnishes us only a very superficial comparison. It cannot fail to extort our admiration when we consider the very early period in which it developed and attained so high a grade, and when we take into account also the people who accomplished so great a work. Yet we can never measure it by our standard of today. Such a course would be as false as unhistorical".[11]

By the beginning of the twentieth century, Indian Medicine had aroused much interest in Western scholars. After conducting a thorough research and investigation into this subject, A.F.R. Hoernle published *Studies in the Medicine of Ancient India*, Part I, Osteology, in 1907. A most comprehensive study yet undertaken on any aspect of Indian Medicine by a Western scholar was done by Hoernle on the *Bower Manuscript*, also called *Nava-nikatan.* Many volumes on this manuscript were published by him between the years 1893 and 1912. The *Encyclopaedia of Indo-Aryan Research*, a monumental work, contained in it articles by Bloomfield on the *Atharvaveda*, by Hillebrant on *A Survey of the Vedic Spells against Diseases* and by Jolly on *Indian Medicine.* The last work was really epoch-making. This encouraged Indian scholars to properly study their own system of medicine.

Further enthusiasm in the subject was aroused by an appreciative work of Neuberger. Writing in his *History of Medicine*, about Indian Medicine, he said : "The Medicine of the Indians, if it does not equal the best achievements of their race, at least nearly approaches them and owing to its wealth of knowledge, depth of speculation, and systematic construction, takes an outstanding position in the history of oriental medicine.

"Thanks to the inexhaustible fount of Sanskrit literature, its development can be traced, in outline, at any rate, from its primeval origins in empiricism and theurgy to its height as a completed system of learning.

"This development is doubly interesting. On the one hand, there are shown many parallels to the medical art of the Greeks, corresponding to other great scientific attainments of the Indians (in philosophy, astronomy, mathematics, geometry, philology) and in their poetic art...On the other hand is seen the determining influence

and Jewish ; indeed it may claim even the first rank among those examples of medical culture which have not experienced which the East, with the general conditions of culture springing from its soil, exercised upon the trend of medical thought.

"The similarity between Indian and Greek medicine of the period is—in its outlines and in certain details—so striking that it is hardly surprising that the originality of the former has frequently been questioned or even denied. The more so is this true since the dates of the more important Indian works are fixed with the greatest difficulty and before the discovery of the most recent manuscripts, they were quite indefinite.

"In consideration of the outstanding independent achievements of the Indians in most branches of science or art and/or their aversion from foreign influences, the trend of opinion today, informed by recent discoveries, is in favour of the originality of Indian Medicine in its most salient features.

"Indian Medicine was in possession of an imposing treasure of empirical knowledge and technical achievement ; it reached to the height of a systematising, theorising school of thought, but it lacked the freedom or individual action essential to the pursuit of real science ; it lacked too unprejudiced judgement and the possibility of criticism, not stopping short even of venerated doctrines. In the strange repressive cultural conditions is rooted the destiny that was to cut short the process of evolution and to lead to scholastic petrification.

"No new era has dawned for this middle age ; as in the long-silent past. So even today, the edifice of Indian medicine stands unaltered, lonely, apart, far from the ever-flowing stream of progress. Nevertheless, the collecting, thinking striving of the Indian physicians had not passed without leaving a trace, as was the case with their numerals, their fables, and tales, their philosophic and religious ideas, their medicine had found its way East and West along the paths of commerce.

"Even if they are not always plainly visible, links can still be found uniting the medicine of India with that of her more fortunate sister, Greece. Through the instrumentality of the Arabs, many of the Indian discoveries were carried far into the West, whilst it is to Indian

influences that Asia, so far as the sway of Buddhism extends, owes more or less of her medical lore.

"That Greek medicine adopted Indian medicaments and methods is evident from the literature. The contact between the two civilisations first became intimate through the reign of Diadochi and the Roman and Byzantine eras. Alexandria, Syria and Persia were the principal centres of intercourse; Indian physicians, means and methods of healing are frequently mentioned by Graeco-Roman and Byzantine authors, as well as many diseases, endemic in India but previously unknown. During the rule of the Abbasides, the Indian physicians attained still greater repute in Persia whereby Indian medicine became engrafted upon the Arabic, an effect which was greatly increased by the Arabic dominion over India.

"Indian influence, in the guise of the Arabic medicine, was felt anew in the West. The apparently spontaneous appearance in Sicily in the fifteenth century of rhinoplastic surgery bespeaks a long period of previous Indo-Arabian influence. The plastic surgery of the nineteenth century was stimulated by the example of Indian methods; the first occasion being the news derived from India that a man of the brick-maker's had by means of a flap from the skin of the forehead fashioned a substitute for the nose of a native."[12]

He further states : "India must also be credited with at least in indirect influence upon the spread of hypnotism, as the empirical practice of suggestion was there more developed than elsewhere. To mention only one fact, it was certainly no accident that it should have been in Calcutta that the English surgeon Esdaile, hit upon the idea of performing numerous operations under anaesthesia induced by hypnotism.

"The care of the sick received a powerful impulse through the Buddhists, who fostered the art of healing, less from scientific than from philanthropic motives and who spread abroad Indian methods under the flag of religious propaganda (hospitals or institutions for medical consultations and the preparation of drugs, were erected).

"The oldest colony was Ceylon, the must marked, influence was produced upon the medicine of Tibet, and similarly the Indian archipelago (Java), further India (Cambodia, Burma), and even China did not remain unaffected."[12]

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14

Āyurveda and Other Ancient Systems of Medicine

Āyurveda influenced, and was influenced, by various systems of medicine developed in other civilizations. Āyurveda was also adopted and adapted in other lands to suit local environment. This aspect of Āyurveda makes an interesting study.

Tibetan System of Medicine

The influence of Āyurveda is clearly discernible on the Tibetan system of medicine, called *Emchi.* This system is still being practised in Ladākh, Lahul, Spiti, Darjeeling, Sikkim, and other regions of the Himālayas.

Āyurveda entered Tibet along with Buddhism. Sron-btsan-sgan Po, who ruled Tibet around A.D. 650, had invited many Indian scholars including Āyurvedic physicians to his country.

Padmasambhava's disciple Vairochana, it is said, came to India and learnt medicine from Indian scholars. It is from Chandranandana that he learnt *Rgyud bzi.* In the tenth century A.D., Rinchen bzan-Po came to India and stayed for ten years to learn medicine. He paid one hundred gold coins to a Kashmiri Pandit Janardan, and learnt from him 120 chapters of *Uan-lag brgyad pai snin po bsdus-pa*, i.e., *Aśtāngā Hridya samhitā* along with its commentary *Chandrika* by Chandranandana. During the later half of the tenth century A.D. an Indian Pandit, Dharm, Srivarman Sne-bo lo-tsa-ba, Dbyig-gi Rinchen and others translated *Vaiduryakabhashya* by Vāgbhata and his own work *Aśtānga Hridya.*

India and Tibet became closer during the middle of 11th century when King Ye-ses-od sent Tibetan scholars to India and also invited Indian scholars to Tibet under the leadership of Atisa Dipankara. Many Āyurvedic texts were translated from Sanskrit into Tibetan between the 12th and 14th centuries A.D.

The *Tanjur*, a voluminous Tibetan religious scripture, contains twenty-two Āyurvedic works in translation. In the secular literature, they have also many medical works ; the most popular one is known as *Rgyud Bzi.*

It is postulated that the pulse and urine examination followed later by Āyurvedic physicians may have been learnt from Tibetan scholars.

Based on Āyurvedic principles and enriched by diagnostic methods of pulse and urine examination, and the peculiar therapeutic products of the Himālayas, the *Emchi* system of medicine fulfilled the needs of the people of the region and hence was taught to the students in the monasteries.

During the medieval period, Chog-po-ri and Men-Chi-khang were important medical centres of Tibet where lamas from far off Mongolia and Buriyat Republic of Soviet Russia, Japan and China came for training in medicine.

About the origin of medicine, the Tibetans accepted the Indian myth that Brahmā was the propounder of this knowledge. But, they amended the mythology by adding that Brahmā was taught medicine by Buddha Kāśyapa.

There seem to exist many Āyurvedic texts in the Tibetan language which are not available now in Sanskrit translation. The study of Tibetan medicine can prove helpful in elucidating some of the Āyurvedic concepts. The medical knowledge available in the Tibetan *Tanjur* and *Kanjur*, however, has not yet been fully studied.

When the Hindus established their colonies in Indo-China and Indonesia during the first millennium of the Christian era, they introduced the knowledge of Āyurveda in these regions. The medical treatise of Suśruta is referred to in an inscription of Cambodia (Kampuchea) in the last decade of the ninth century A.D. King Jayavarman VII of Cambodia (A.D. 1181-1281) established 102 hospitals (*arogyaśalas*) in his kingdom, and an inscription in 23

Sanskrit verses gives a detailed account of diet and medicinal herbs supplied to these hospitals.[2]

The Burmese also adopted the Āyurvedic system to a large extent. Though the *Suśruta* and other Āyurvedic works were not translated into Burmese before the eighteenth century A.D., some of the Burmese technical terms in medicine are derived from Sanskrit.

Āyurveda was introduced into Ceylon by the Buddhist missionaries in the early centuries of the Christian era or possibly even earlier.

Ayurveda and the Greek Medicine

Some of the similiarities between Indian medicine and Greek medicine are so striking that their inter-dependence cannot be refuted.

Historical tradition suggests that the ancient Indians and the Greeks knew about each other even before the sixth century B.C., if not directly, at least through intermediaries. About B.C. 519, the Achaemenidean king, Darius I, is known to have sent a Greek seafaring man Skylax of Karyanda to the Indus Valley to explore the possibility of conquering the region. Since then and after the conquest of the Indus region by Darius I, the Indians and the Greeks came in close contact with each other, as both had parts of their lands under the Persian occupation. The Greek physicians are known to have adorned the court of the Persian kings, and Indian troops were part of the forces Xerxes led against Greece in B.C. 480. Such contacts between the two peoples continued till the time of Alexander. It was during this period that Hekataeus of Milet, Ktesias, Herodotos and others came to know about India. Herodotos even describes a meeting between Greeks and Indians discussing, through interpreters, the best way to treat corpses at the court of Susa, presided over by the king.

Further evidence of the exchange of medical learning between the two civilisations is provided in their medical treatises. The *samhitās* of *Charaka* and *Suśruta* reveal many analogies between the Indian and Greek systems of medicine. Jolly gives a list of some of these analogies: the accomplished humoral pathology; the raw, ripening and the ripe stages of fever,[3] the division of healing remedies into hot and cold, also dry and oily, i.e., *moist*[4], the healing of

diseases by remedies of opposite character;[5] the characterization of physicians and the directions given to them reminding us of the oath of Asclepias[6], the influence of seasons on dietetics[7] ; the quotidian, tertian and quartan fever[8], ksaya (phthisis), etc. in individual diseases ; the often occurring sensation of creeping of ants on the body in respect of symptoms ; the simultaneous formation of all parts of the body in the doctrine of development[9] ; the birth of twins by the equal division of the quantity of semen[10] ; the relation of the right part of the body to the male sex of the foetus[11] ; the viability of the foetus in the seventh month and the contrary in the eighth month[12] ; the dismembering of the dead foetus and its extraction with a hook fixed in the eye sockets[13], the movement for the advancement of the placenta[14]; in surgery, the method of lithotomy[15] ; the paracentesis in dropsy[16], branding, cauterizing, cutting of haemorrhoidal nodules[17], bleeding, cauteries and many surgical instruments ; the operation of the right eye with the left hand and of the left eye with the right hand and other details of the operation of the cataract in ophthalmology[18].

Such an extensive common area of knowledge could not have been just accidental ; they do indicate an exchange of ideas and information over a long period.

Evidence of direct communication between Greek and Indian Medicine is available in some treatises of the Hippocratic Collection. A detailed Indian medical recipe to clean the teeth is given, acknowledging its Indian source. Elsewhere pepper has been stated as an Indian drug used for ophthalmic and gynaecologic suppurations.

The Hippocratic treatises do not quote any Indian medical doctrine while they mention Indian drugs, e.g., *kardomomen*, *amomon*, *peperi*, *kinnamonos*, *akoras*, *sesamon*, etc. Nevertheless we discover the probability of an exchange of knowledge in other books of the Hippocratic Collection in the form of concepts closer to the Āyurvedic system than to the Greek one. It is most obvious in the case of a treatise called *Peri phuson* which means 'about the winds'.[19]

At the time of Alexander's invasion of India, the Greeks thoroughly knew the achievements of Indian physicians in the field of hygiene, diet, snake-bite, and also the Indian veterinary science regarding elephants.

Some similarities between the Indian medical theory of *tridoṣa*

and the Greek humoral theory have led to many comments and controversies regarding the mutual borrowings. An understanding of the origin and basis of the two theories would help in doing away with some of the needless controversy.

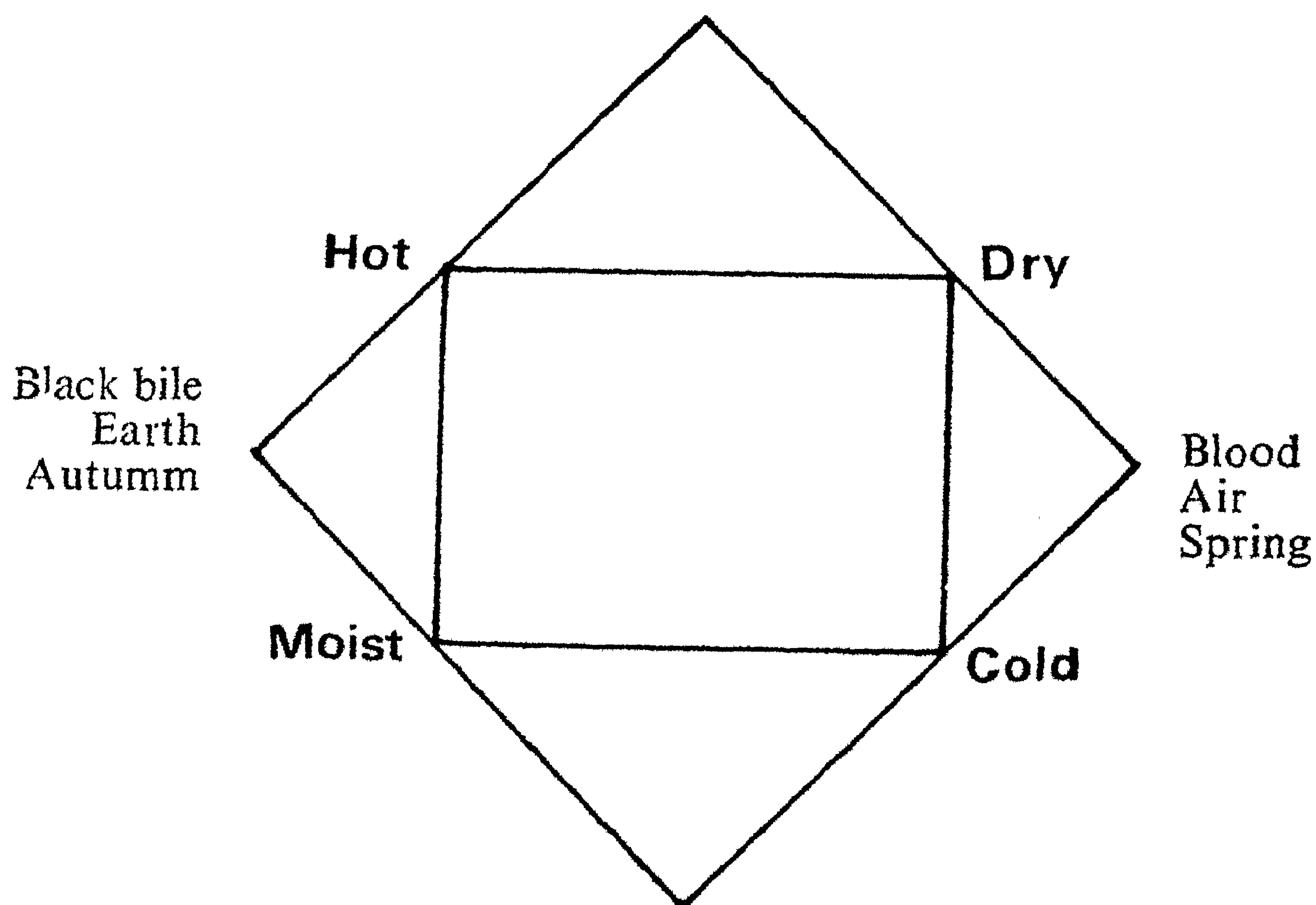
Empedocles of Agrigentum in Sicily (B.C. 505-443) was first to introduce into Greek thought the doctrine of the elements earth, air, fire, water, as the fourfold basis of all things. The Greek humoral theory owes much to the philosopher-physician Alcmaeon of Crotona (5th century B.C.). According to him the human body was made up of these primitive substances ; health resulted from their balance and diseases from their imbalance. Corresponding to the four elements of earth, air, fire and water, were the qualities—dry, cold, hot and moist—according to the scheme : hot+dry=fire ; hot+moist=air ; cold+dry=earth ; cold+moist=water.

Long before Aristotle (B.C. 460-370), it was held that corresponding to the four elements of Empedocles (fire, air, water and earth) and four qualities (hot, cold, moist, and dry), are the four humours of the body, viz., blood, phlegm, yellow bile and black bile. Phlegm, the coldest of all humours, increases in winter. At that time, therefore, the phlegm diseases are prevalent, and you can see people sneezing and blowing their noses. In the spring, phlegm is still powerful but the circulation of blood increases, for it is moist and hot like spring. Dysenteries, bleeding from the nose and other haemorrhages are more frequent at this time. The hot and dry summer sets the bile in motion. and the bile dominates till autumn. People vomit bile, their stools are bilious, fevers have a bilious character, and the skin is frequently yellow. Autumn is a dry season, beginning to become cold. At the time the black bile dominates the body. Thus the four humours are always present in man just as the qualities hot, cold, dry and moist are always present in nature, but the blend is not always the same and this explains the different dispositions of man towards diseases according to the season of the year.

Simple as this theory is, it opened up wide horizons. Two pairs of humours with opposite qualities were indeed the ideal carriers of the balance of health. But more than this the qualities corresponded not only to the seasons but also to the elements which, according to Empedocles, constituted the universe ; earth, water, fire and air. Thus it was possible to establish a direct relationship between the macro-

cosm of the universe and the microcosm of the organism and to link them up with the atmospheric changes due to the seasons.

The same elementary qualities were found in nature and in man, who thus appeared as an integral part of nature. This relationship also paved the way for further systematizing. Not only had the elements, humours, and seasons an elementary quality but also the organs, diseases, and remedies. Once the principle was established that contraries should be cured by contraries and once one had a key to the qualities of the various objects of nature, treatment became mathematical and medicine seemed to have lost its conjectural character. The relation between element, honour, and seasons is best illustrated below:



There are many fundamental and essential differences between this Greek theory and the *tridoṣa.* The Indian theory starts with the *panchabhūtas* or five elements, *viz., vāyu* (air), *prithvi* (earth), *teja* (fire), *apa* (water) and *ākāśa* (ether). The Greek theory starts with four elements, viz., air, earth, fire and water. The Indian *doṣas* form a triad (except with the *Suśruta*), whereas the Greek humours form a tetrad. The *doṣas* are *vāyu* (air), *pitta* (bile) and *kapha* (phlegm) ; the humours

are blood, phlegm, yellow bile and black bile. Blood is an important humour in the Greek theory, while it is considered a *dhātu* in the Indian theory. The *vayu* (air) does not form one of the Greek humours while it is the most important in the Indian theory. Besides, there is a fundamental difference in the conception of production of diseases by the humours.

The *doṣas* by themselves cannot produce any disease, they must be disordered by their respective *nidānas*. After they are disordered, they vitiate the *dhātus* or the constituents of the body and produce diseases in them. In the Greek theory, it is the imbalance of the humours that constitutes disease. Thus it will be seen that while the similarities are superficial, the differences are fundamental.

While Charaka and other earlier and later writers mention three *doṣas*, Suśruta mentions four of them ; he includes blood as one of *doṣas*. This could possibly be quoted as an indication of the Greek influence ; and if that si so, it would also indicate that the Greek influence could not gain an upper hand over Āyurvedic medicine since this fourth humour never became important and was, in fact, soon derecognized.

That the *tridoṣa* theory is truly Indian is strongly witnessed by the fact that its origins can be traced in the Upaniṣadic, Brahmanic, and even Vedic sources ; and the Indian philosophical systems of Nyaya and Vaiṣeśika form its basis.

Did the Greek philosophers borrow the Indian ideas which formed the basis of their humoral theory ? This cannot be said with any certainty, though there are some hints available in this regard. The philosopher who influenced Hippocratic medicine most was Pythagoras ; Alcmaeon who propounded the doctrine of the four humours belonging to the school of Pythagoras. Pythagoras is known to have visited India.

About his visit to India, Hamilton, in his *History of Medicine, Surgery and Anatomy*, states :

"Quitting the land of his nativity, while under the dominion of Polycrates, his zeal for the acquisition of knowledge led him first to Egypt, at that period and for ages after, the grand emporium of medical and every other useful knowledge. Having at this celebrated fountain of learning exhausted the supply without diminishing his thirst, he sought farther means of slaking it, in the then almost un-

explored peninsula of India, whence he returned, bringing back with him the doctrine of Metempsychosis, the prejudice against animal diet, the mysterious notions respecting the powers of numbers, and other visionary and fanciful tenets of the East...On his return to Europe, he settled himself at Crotona, a small town of Magna Greecia in Italy, where he founded a school about the time, as Cicero acquaints us, of Tarquinius Superbus, where, among the other branches of knowledge which he imparted to his pupils, the study of the animal economy was not forgotten. He likewise introduced a regular system of dietetics, and taught his pupils the theory, if not the practice of, Medicine."[20]

Whether the Greeks borrowed ideas from the Indians to formulate their humoral theory is difficult to say on the basis of the evidence available just now. In view of the paucity of evidence and the fact that the contacts between the two peoples and the Systems of Medicine were there to interact upon each other, it would be safer to suggest that the two systems had fundamentally independent growths, but the contacts did lead to some exchange of ideas.

Ayurveda and Unani Tibb

During the reign of Harun al-Rashid (786-814 A.D.) the Abbasid Caliph, Baghdad was the most important city of the Arab world, and one of the most important cultural centres of the world. The Barmecid family of Indian physicians occupied a very important position in his court. The Barmecids were the descendants of the chief priest (*pramukh*), arabicized Barmak of the Buddhist temple at Balkh. The first Barmak to accept Islam was probably Khalid. Barmecids encouraged the Indian physicians to come to Baghdad. They also translated into Arabic and Persian many of the Indian medical classics.

The following Indian medical classics are known to have been translated into Arabic and Persian.

1. *Charaka*, translated into Persian, probably by Manka.
2. *Susrud*, rendered into Arabic by Manka, at the suggestion of Yahya.
3. *Astankar*, rendered into Arabic by Dhan.
4. *Nidana*, translator's name not known.

5. *Sindhastaq*, translated into Arabic by Dhan.
6. *Kitabu's Sumun* (the book of poisons), translated into Persian by Manka at the suggestion of Khalid, the Barmecid.
7. The book of Rusa, the Indian woman, dealing with the treatment of women.
8. The book dealing with the opinions of the Indians about the various kinds of snakes and their poisons.
9. A short treatise on drugs.
10. The book on the treatment of pregnant women.
11. The book of Intoxication (Intoxicants).
12. The book dealing with one hundred diseases and one hundred medicaments by Tugashtal (?).
13. The book on the effect of mania or hysteria.
14. The book giving names of drugs in ten different languages.
15. The book dealing with drugs, about the properties and nature of which the Indians and Greeks differ.[21]

Indian physicians occupied high positions in Baghdad hospitals. They were popular both among the chiefs as well as the common people. Many stories are recorded of their successes in curing patients when others had failed. It is said Harun-al-Rashid himself once suffered from some serious disease which baffled the talents of the practitioners of the Greek systems of medicine in Baghdad. At last, at the suggestion of one of his courtiers, a physician from India was called by the Caliph who was treated by him and cured of his disease.

Manka was one of the most well-known Indian physicians. He knew Persian as well as his own native language. He was attached to the hospital of the Barmecids and cured many nobles with his remarkable skill of healing. He translated many Sanskrit books into Persian and Arabic, and was amply rewarded by the Caliph. Later on he embraced Islam.

Ibn Dhan was another prominent Indian physician, a contemporary of Manka. He was called to Baghdad by Yahya, the Barmecid, and was made director of a hospital. He too translated medical books.

Another successful Indian medical practitioner at Baghdad at

the time of Harun-al-Rashid was Salih, the son of the descendant of Bhela. It is said that once a cousin of Harun-al-Rashid, named Ibrahim, suffered from a fainting disease. The Caliph's personal physician, Gabriel, examined him and declared that the patient was sure to die within a few hours. The Caliph gave up hope. One of his courtiers suggested that Salih, the descendant of Bhela who was as great a master of Indian Medicine as Gabriel was of Greek Medicine, might be called for a second opinion. The suggestion was accepted. The physician visited the patient, examined him, and reported to the Caliph that the patient would not die of the disease that he had. He offered to give up all his property and possessions if the patient died. Unfortunately the patient fainted and was mistaken for dead. Preparations were made for his burial in the pesence of the Caliph and others. Salih strongly protested. He said that the patient had only fainted and was not dead. Then he actually demonstrated it by pricking a needle in his left thumb at which the patient withdrew his hand. The Caliph was happily surprised, and Ibrahim was taken out of his coffin, bathed, and put on the bed. Then Salih blew some snuff in the nose of the patient and after about ten minutes his body quivered, he sneezed, sat up, and kissed the hands of the Caliph who inquired from him as to what had happened to him. He replied that he had a sound sleep.[22]

During the ninth and the tenth centuries A.D., Indian medicine and medical men were held in high esteem everywhere. This is also stated in the works of some of the Arab scholars of this period. That the Arabs recognised the achievements of Indian medicine is also evident from the fact that many of the Arabic and Persian treatises on medicine devoted entire chapters to the Indian System of Medicine.

Important contributions of Unani Tibb to Ayurveda were in the field of diagnosis, the examination of the pulse, in therapeutics, the use of opium and other metallic compounds, in the field of public health and the introduction of the concept of hospitals.

The Caliphs spared no efforts to get Greko-Roman treatises translated into their own language. They invited scholars well-versed in Greek, Syriac, Persian and Arabic languages to Baghdad for translating Greek manuscripts into Arabic. Works of Hippocrates, Aristotle and Galen were given priority. Besides commissioning these

translations, the Caliphs invited famous physicians from Jundi-Shahpur to provide medical consultancy to their hospitals in Baghdad. At the court of Harun-al-Rashid, Jabir (Geber) was the most famous alchemist and physician.

Thus at the beginning of the ninth century, we find some of the most famous medical men from the East and the West meeting in Baghdad and ushering in a Renaissance. Indian physicians learnt the examination of the pulse at Baghdad from Greek and Arab physicians who were expert in this sort of diagnosis. Knowledge of and interest in alchemy, use of opium and many metallic compounds for treatment of various diseases was also acquired from the contact with the Greeks and the Arabs.

The concept of hospitals on the modern lines is a Persian contribution. The first known hospital was established at Jundi-Shahpur in Persia. In 636 A.D., when the Arabs invaded Persia, they captured the city of Jundi-Shahpur. The existence of a hospital there provided Mohammedans with an idea of having such hospitals in Baghdad and later to other territories which they conquered.[23]

When the Muslims conquered large parts of the Indian sub-continent, they brought the concept of hospitals along with other institutions and traditions. Mohammad bin Tughlaq (1325-1351) and Firuz Shah Tughlaq (1352-1388) built many hospitals in their domains. Sher Shah (1540-1545) followed the lead. Since then hospitals have been a part of the city life. One of the twelve commandments issued by emperor Jehangir (1605-1627), on ascending the throne, was for the establishment of a hospital in all the larger cities in his domain. Allauddin II (1436-1458) was the earliest Mohammedan king of the Deccan to build a hospital, Daru-ul Shifa, at Bidar, his capital. Here drugs and food was provided to patients free of charge.

These hospitals were mainly staffed by Mohammedan physicians versed in Greek and Arabic (now called Unani) systems of medicine. But many of them had Āyurvedic physicians on the staff as well. This tradition started in the ninth century A.D. by Harun-al-Rashid, the Caliph of Baghdad, to have both Hindu and Mohammedan physicians in his hospitals, continued in India.

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Revival of Āyurvedic Studies

When the British rule was established in India, the Āyurvedic system of medicine had already passed its zenith, and was in a state of stagnancy. The British doctors in India tried to study this system of medicine, but since it was based upon principles different from those of the Western system of medicine, they were unable to go any further, and labelled it as "queer". Many Europeans, however, found that the practitioners of Āyurveda successfully treated the patients suffering from different diseases. But no official encouragement was given to Āyurveda by the British administrator. In fact, subtle means were adopted to stifle the indigenous system and its practitioners in favour of Western medicine.[1]

However, Āyurveda remained firmly entrenched in the country-side, and rivalled Western medicine in urban areas as well. The nationalist fervour of the late nineteenth century raised the demand for the revival of the ancient systems, their study and research.

By the beginning of the twentieth century, many well-meaning individuals and private organizations had started taking keen interest in Āyurveda. Āyurvedic dispensaries were started in different cities and they did useful work. During the influenza epidemic of 1918-19, Āyurvedic hospitals set up in Poona city, rendered excellent service to the victims of influenza. The Administration Report of the Poona city Municipality (1918-19)[2] recorded : "It will not be out of place here to make a special mention of the temporary Āyurvedic hospitals started and conducted with conspicuous success during the terrible influenza epidemic of the year under report. While the whole city was writhing beneath the crushing weight of the malady, an Āyurvedic

ward or rather hospital was opened in the buildings of the New Poona College, kindly placed by its Principal at the disposal of the Municipality. Another Āyurvedic hospital and a dispensary were also opened in Bhawani Peth by the kindness, public spirit and sacrifice of Messrs Poman and S.A. Manurkar a well-known Councillor of this Municipality. It must be noted with pleasure that the idea of such a hospital was brought to the forefront and materialised by the efforts of the Poona Vaidya Mandal through its President, Mr. Vasudeo Shastri Shedanikar, and its energetic Secretary, Mr. Krishna Shastri Kavade, who was assisted by zealous colleagues, Messrs Appasaheb Gadre, Joshi, Apte, Date, Jadeav and others. The scheme would never have been carried out, had not the late lamented Mr. H.N. Apte, the then President, given it his whole-hearted approval.

"The starting of an Āyurvedic hospital to meet a pandemic was in itself a bold experiment. For, as rightly observed by Mr. N.C. Kelkar, the President of the Municipality in his address to Lord Willingdon, it was the Āyurvedic system of treatment that was, so to say, on its trial. The trial was confidently accepted, nay, invited by the Mandal, and there is now no doubt that the best traditions of Āyurveda have been thereby amply vindicated. The opening of Āyurvedic hospitals was a novel and unique step. Nowhere in the whole of the Presidency was such an experiment tried or even contemplated at such a time of grave crisis and Poona Municipality was well advised in coming forward to support the beneficial experiment initiated by the Vaidya Mandal. As to the marvellous success of the Āyurvedic treatment, Dr. Paterson of the Mission Hospital and Miss Henry, a nurse of the Willingdon War Hospital have borne personal testimony.

"But more than their success in treatment, the Ayurvedic hospitals carried out another great object. They inspired in the mind of the suffering people a confidence which nothing else could have created. This fact is prominently mentioned in his report of Prof. Kanitkar of the Fergusson College who said that the unwillingness of the stricken people to submit to the hospital treatment was insuperable. Nothing could induce them to go to a hospital, but when the Āyurvedic hospitals were opened, they were exceedingly eager to avail themselves of that treatment."

In course of time the practitioners of the Western system of medicine started showing interest in the drugs used in Āyurveda.

Dr. R.N. Chopra, Head of the Pharmacology Department in the School of Tropical Medicine and Hygiene, Calcutta was keenly interested in investigating and making use of indigenous drugs in the treatment of different diseases. Writing in the *Indian Medical Gazette*, in 1923 he stated :[3] "Considerable interest has of late been taken by the Indian public and by its professional members regarding the use of indigenous drugs in the treatment of disease. Indeed it has been argued that apart from economic consideration, these drugs are more suited to the habits of the people and the climatic conditions that prevail in this country. The question of the restoration and development of the indigenous systems of medicine has therefore been discussed in the Indian Legislative Assembly and the different Provincial Councils. While we are not concerned here with the merits of such revival, we have no doubt that out of the large number of drugs used by Kavirajas and Hakims for centuries past and still in use, there are some as least that deserve the reputation they have earned as cures. On the other hand, there are others of little therapeutic value that are given only because they are mentioned in some old manuscripts, and no one has taken the trouble to confirm the truth of these statements. Medicine is a progressive science ; in every department an attempt is being made to replace empiricism by rationalism, and nowhere is this more evident than in the science of pharmacology and therapeutics."

Some of the well-informed practitioners of the indigenous systems of medicine welcomed scientific investigations into Āyurvedic drugs. They were however critical of the approach adopted, wherein the assessment of the drugs was to be made by those who were not acquainted with the principles of the Āyurvedic medicine. Representing such a view, Srinavasa Murty, an eminent Āyurvedic practitioner, wrote in 1923 : "There are many well-meaning persons, who, while admitting readily and even enthusiastically the truth of the general efficacy of the Indian system of medicine, are nevertheless of opinion that it is not necessary to study the science of Indian medicine to know the use of remedial measures, and that the practitioners of Western medicine may well be trusted to use them in the light of their own pathology, diagnosis and the like. They are ready to incorporate into their pharmacopoeia such of these indigenous drugs and methods of treatment which are found efficient in practice, but, they have no

patience with the rest of the Indian systems themselves. In other words, they would take in the art but would shut out the science. They would gladly take in the sweet fruits which the tree of Indian medicine bear but would starve and even cut down the tree itself. This, to our minds, seems a most illogical and unscientific procedure, which, if really put into practice, may easily be attended with dangerous and even disastrous consequences, more especially in the case of those highly potent remedies used by practitioners of the Siddha system. Such use of indigenous drugs and remedial measures would be as unscientific and dangerous as quackery, as for instance, the use of vaccine, sera and hypodermic remedies by Āyurvedists who have not learnt the science on which their use is based, though, by a little practice, they may easily learn the art of hypodermic or even intravenous injections. If this is born in mind, one can easily understand why Āyurvedists object so strongly to the value of Āyurvedic or indigenous drugs being tested and judged by persons who do not have any understanding of Āyurveda."[1]

Srinavasa Murti went on to state : "Here I would strongly repudiate the sweeping charge made in some quarters that Āyurvedic drugs are used empirically. In fact, there is less empiricism in Āyurvedic practice than we find in the practice of Western medicine. Besides, there seems to be strange idea in some quarters that the success of the Āyurvedic physician depends much on the high efficacy of individual indigenous drugs. This idea, the main spring of action in the so-called researches in indigenous drugs of which we hear so much in these days, is simply erroneous. The success of the Āyurvedic physician is due not to the charm of this or that drug but to his clear grasp of the doshic derangement and his selected and well-considered treatment of that derangement, according to well-defined principles of therapeutics.

"As to the form in which medicines are given, I should like to point out that fresh juices, powders, infusions, and decoctions are always preferred to preserved drugs in view of the vitamins and the other active principles found only in fresh drugs. The use of minerals in the form of very finely powdered (often impalpable) oxides and colloids is also a special feature of Āyurvedic practice, which superficial observers have occasionally tried to belittle by their meagre but vaunted knowledge of chemistry. They seem to forget that there

are numerous unassilable facts in therapeutics, which present-day chemistry is not yet advanced enough to explain."

Srinavasa Murti concluded : "It should be remembered that there are hundreds of drugs—vegetable, animal and mineral—used widely by Āyurvedic practitioners which their know-all Western trained rivals have not even heard of yet. To the bigoted and prejudiced medical man trained in Western medicine alone, these remain a closed subject because he would never come to study them under proper guidance."

Encouragement to the study of indigenous systems of medicine, including Āyurveda, began with the introduction of local self-Government in 1919. Committees were set up in different provinces to study and recommend how best the indigenous systems of medicine could be promoted and given state recognition. Between 1921 and 1947, many of these Committees met and made their recommendations, but the action taken on these recommendations remained insignificant.

The Chopra Committee proposed an integration of Indian and Western systems of medicine with a view to achieving their ultimate synthesis. In their view, a type of concurrent education in the old and new systems should go on for some time and research by eminent experts of the Indian and Western systems should also be simultaneously promoted. In this way the Chopra Committee considered that the conditions necessary for a final synthesis should be brought into existence.

The Chopra Commit'ee was followed by the Pandit Committee (1949) and Dave Committee (1955). They too recommended the concurrent teaching of Āyurveda and modern medicine with a view to making those trained under that scheme more useful to the community. The Pandit Committee was instrumental in establishing the Central Institute of Research in Indigenous System of Medicine and a Post-Graduate Training Centre for Āyurveda, both of which are located at Jamnagar.

The Udupa Committee, appointed by the Government of India in 1957-58 to assess and evaluate the status of the Āyurvedic system of medicine, reviewed the entire situation and made several recommendations relating to professional education, medical care, research and drugs. The Committee also recommended the establishment of a

Council of Indian Medicine and a Council of Āyurvedic Research by the Central Government.

The Council of Āyurvedic Research was constituted by the Government of India and it set up a number of sub-committees on education, research and other matters.

The sub-committee on Āyurvedic education was asked to examine *de novo* the entire question of Āyurvedic education, paying due regard to the integrated and *śuddha* system of training and to prepare a scheme of training which could be introduced uniformly throughout the country. The Education Sub-Committee took note of the fact that there was dissatisfaction against the concurrent scheme of training in the various Āyurvedic colleges existing in India, that there was a lack of faith in that type of training in the minds of Āyurvedic students who qualified through those institutions, and that this dissatisfaction existed not only in the colleges for integrated training but also in those teaching *śuddha* Āyurveda. The view of the Education Sub-Committee was that whether the teaching was integrated or *śuddha*, the real defect was that it lacked objectivity and a scientific approach and that what was being taught in the name of Āyurveda had little or no bearing on its practice. The teaching was more or less academic. Failure to apply the scientific methodology laid down by the *Charaka* in the ancient past, namely, theoretical knowledge, direct observation, induction, deduction and analogy and reasoning, had made the teaching and practice of Āyurveda in the present generation archaic and dogmatic.

The Council of Āyurvedic Research considered the recommendation of the Sub-Committee on Āyurvedic Education and the syllabus and curriculum submitted by this Sub-Committee and gave approval to the concurrent course of training with the primary object of producing an efficient *vaidya*-cum-basic doctor who could be utilised in the national health development plans and in undertaking scientific research and teaching programmes.

The Mudaliar Committee (1961) re-examined the who'e question of Āyurvedic teaching.[5] This Committee made its recommendations with the following aims and objects in mind :

"(a) It is necessary to organise the training in Āyurveda in such a manner as to ensure that those who practise this system have had

sound training in it. In our opinion the integrated or concurrent system of training stands condemned and should not be continued.

"(b) An integration of Modern Medicine and Āyurveda is eminently desirable and all steps towards achieving that end should be promoted. Such integration should result on the development of a system of medical knowledge and practice based on all the best that is available in modern Medicine and in Āyurveda. To us the idea of a concurrent development and maintenance of different systems of medicine for all time is unacceptable. The approach to the interpretation of health and disease and to the development of appropriate measures to promote health and to deal with disease in its preventive and remedial aspects, must rest on sound scientific knowledge. Modern medicine has had its roots in the ancient systems of medicine—Indian, Arabic, Greek and Roman, and the extraordinary growth and range of utility of Modern Medicine are due to the contributions it has received from the phenomenal growth of the physical and biological sciences in comparatively recent times. A synthesis of the type that we envisage will therefore be through the incorporation in modern medicine of all that can be tested scientifically and proved to be useful in the Āyurvedic system.

"(c) Research in Āyurveda, if it is to be organized properly, would require that it should be undertaken by persons possessing a sound knowledge of Āyurveda and of Modern Medicine as well as familiarity with the methods of modern scientific research. It is with these ends in view that we are putting forward proposals to develop a body of well-trained persons for research.

"(d) Before the suggested synthesis can be completed, there will be a transitional period during which while intensive research into Āyurveda would be carried out, the utilization of those trained in this ancient system for providing public medical care in a manner designed to spread such care over the widely scattered population of the rural areas, would be both desirable and practicable. In attempting to do so, however, it is necessary to ensure that the trainees should be enable to offer to the public, medical treatment and preventive care of reasonably high standard of quality. Our proposals would therefore involve sound education in Āyurveda first and an intensive course later in certain branches of Modern Medicine such as preventive health work, obstetrics, and some others, without which no member of a State

medical service will be able to function satisfactorily at the primary health centre level for catering to the needs of the rural population.

"Our recommendation in the preceding paragraph for the utilisation of those who are well-trained in Āyurveda and have received supplementary training in certain essential aspects of Modern Medicine, is to ensure that, when under present-day conditions, large sections of the people in rural areas lack medical aid of a reasonable standard of quality, our first concern should be to provide for them some measures of medical care without delay. But we are convinced that, on the long-term view, all those who cater to the medical needs of the people should be required to have a recognised qualification in Modern Medicine. Āyurveda will then become a subject for post-graduate study, its knowledge being engrafted on to this basic foundation of a knowledge of Modern Medicine."

The Mudaliar Committee then set forth their recommendations as follows :

"(1) As already pointed out the integrated system of training should be abolished and training in *shuddha* Ayurveda should be instituted.

"(2) The first essential for imparting training in Āyurveda is that the student should be in a position to study the original books in that system under the direction of adequately trained teachers. The establishment of an institution for finding authentic and original manuscripts and books in Āyurveda, for compiling the treasures of that system, which may be scattered in different parts of the country, and for publishing the compilations for the benefit of the students and teachers, is an urgent step of great importance. Such an institute should appropriately function under the Central Government in collaboration with State Governments. It may be designated the Central Institute of Indian Medicine.

"(3) Chairs of Indian Medicine should be established in modern medical colleges in the country.

"(4) Taking note of the fact that most of the books and manuscripts in Āyurveda are in Sanskrit, the Committee recognises that a student of Āyurveda should have a good knowledge of Sanskrit ; similarly for Siddha, he should be well versed in Tamil, and for the Unani system, in Arabic.

"(5) These students should have general education at least up to the School-leaving Certificate standard. It is in our opinion an advantage

if some of them possess the basic qualification of the pre-professional course to permit of their admission to modern medicine colleges later, if they desire to take up the study of modern Medicine ; at least about 25 per cent of those admitted for training in Āyurveda should be persons with the basic qualification for the pre-professional course.

"(6) While the preparation of proper syllabi and courses of study should be left to experts in Āyurveda, we consider that the period of study will have to extend to about three or four years. The students will then be enabled to concentrate their attention solely on Āyurveda and to study it well. We do recognise the need for giving a degree qualification if the students are trained upto the standard we have in view.

"(7) The students who qualify in Āyurveda should be given opportunities to be trained in the modern system of medicine, if they desire to do so. We feel that, after completing the Āyurvedic course and passing the prescribed examinations, a student will require a four years' course of training if he wishes to take the basic M.B., B.S. degree in modern medicine. We recommend the grant of a university degree in the modern system, if the student qualifies himself in the examinations prescribed for the degree.

"(8) However, in the case of the majority of those taking the qualification in Āyurveda, we feel that, as already suggested, subsequent training in modern medicine may be confined to certain essential parts of modern medicine, without which a person trained purely in Āyurveda will not be able to function, without reasonable efficiency, in a modern health service for the community. The courses of study in the necessary special subjects of Modern Medicine may require a period of two to three years, and these courses should be so devised as to provide the gradua tes of Āyurveda with the missing knowledge in preventive medicine and in other areas of medical practice essential for them as members of the national health service.

"(9) We recognise the great importance of provision for post-graduate training in Āyurveda. The development of post-graduate centres, eventually one for each region, is desirable and the development of such centres should be [guided by the experience gained so far at Jamnagar. To attract students who have qualified themselves in the modern system of medicine to these centres, we feel that our

recommendation for the establishment of chairs of Indian Medicine in all medical colleges will prove helpful.

"(10) Research wings should be established in the Central Institute of Indian Medicine and in all chairs of Indian Medicine in medical colleges, where intensive research into Āyurveda will be promoted.

"(11) These post-graduate institutes should provide facilities for higher training to both types of medical men we have envisaged, namely, those who, after intensive training in Śudha Āyurveda, take a degree in Modern Medicine as well as those who, after qualifying themselves in Modern Medicine, learn Āyurveda as an intensive post-graduate course. Research in Āyurveda in respect of medicinal plants, drugs and diseases will be an important function of the institute and the students under training should be encouraged to interest themselves in the researches that are in progress. We are convinced that the growth of a body of trained personnel on the lines we have indicated is essential in the interest of Ayurveda and of Modern Medicine. Integration of the two systems of medicine will eventually come about only as the result of the labours of such scientific workers.

"(12) The Central and State Governments should provide generous financial support to the trainees. An adequate understanding of both systems requires a good deal of time and arduous study and after this prolonged training their services will be devoted to research and academic activities. The lure of private practice and of the rich reward that such practice provides are bound to attract talented medical men and to draw them away from a career of research. It is all the more necessary therefore, that those who elect to become truly qualified in both systems should not be made to suffer financially.

"Selection for admission to the courses meant to create this body of workers should be made carefully and it should be based on merit. During their course of study, they should be given reasonably good stipends, and when they are admitted into service as teachers, and research workers, the emoluments offered to them should be such as to attract persons of talent and to keep them contented. We consider that the expenditure thereby incurred by Government will prove to be in the best interests of India and of other countries.

"Our attention has been drawn to the growing interest that Indian medicinal plants and drugs have been receiving in foreign

organised pharmacies can be established under State control and if the procedures for manufacturer in respect of individual preparations are regulated in all State pharmacies. A good deal of collaborative work in the way of research will be required in this field, and our proposals to stimulate intensive research activity in the Central Institute of Indian Medicine, in the suggested post-graduate regional institutes and in the research wings attached to the Chairs of Indian Medicine in medical colleges should go a long way to achieve this purpose. The State pharmacies should be the sources for all drugs utilised in the various Āyurvedic hospitals and dispensaries maintained by Governments and local bodies and in all medical institutions receiving grants from Governments and local bodies. In this way some measure of standardisation will be obtained in respect of the drugs used in all the more important Āyurvedic institutions in the country.

"As assessment of the extent to which standardisation in the usually accepted sense of the term can be achieved, will be reached only as the result of an elaborate programme of research over a period of some years ; in the meantime, the suggestions made in the preceding paragraph should help to make available Āyurvedic preparations of reasonably high quality to a large part of the public who are treated by this system of medicine. The use of adulterated drugs will also be avoided in respect of this section of the population."

Many of the above recommendations of the Mudaliar Committee were accepted by the Government and follow-up action taken. The Central Council for Research in Indian Medicine and Homoeopathy was constituted in 1969 to initiate, aid, develop, and co-ordinate scientific research in different aspects, fundamental and applied, of Indian Systems of Medicine, including Homoeopathy and Yoga. The Central Council of Indian Medicine, New Delhi, was constituted under the Indian Medicine Central Council Act, 1970, for ensuring uniform standards of education and the registration of the practitioners of Indian Systems of Medicine.

In 1973, the Government of India was giving 100 per cent assistance to the Banaras Hindu University, Varanasi, and Gujarat Āyurvedic University, Jamnagar, for post-graduate training and research in Āyurveda.[6] In addition, assistance was given under a centrally-sponsored scheme for establishment of 13 departments for

post-graduate training and research in Āyurveda in Trivandrum (2 departments), Lucknow (2 departments), Hyderabad, Patiala, Bombay, Raipur, Mysore, Jaipur, Gwalior, Udaipur and Bangalore. The under-graduate colleges of Indian Systems of Medicine run by voluntary organizations were also being given grants subject to a ceiling of Rs. 5 lakhs per college for the construction of building, hostel, laboratories, pharmacies, herb-gardens and for purchasing essential equipments with a view to improving the standard of education.

According to the Report of the Ministry of Health and Family Planning 1975-76, the Indian Systems of Medicine formed part of the National Service Programmes and their development.[7] An amount of Rs. 635 lakhs was provided for the development of I.S.M. schemes during the Fifth Five Year Plan. A National Institute of Āyurveda was established at Jaipur. The main objects for which the Institute is established are to promote the growth and development of Āyurveda, to introduce graduate and post-graduate teaching in all branches of Āyurveda, to conduct research on various aspects of Āyurveda and to conduct experiments and develop patterns of teaching in under-graduate and post-graduate education in all branches of Āyurveda.

The Central Council for Research in Indian Medicine and Homoeopathy is devoting its attention towards drug standardization and drug research, clinical research, survey of medicinal plants, literary research and on fundamental doctrines. The clinical research programmes on a variety of conditions like rheumatism, peptic ulcer, diabetes is doing useful work in the field.

The Central Council of Indian Medicine has also prescribed minimum standards of education for Āyurveda, Siddha and Unani. It has also worked out a curriculum and syllabus for the post-graduate training and research in these systems.

Since 1977, efforts are being made to make use of Āyurveda and other indigenous systems of medicine for the health and family welfare of the rural population. Thousands of health workers are being given preliminary training in the use of both indigenous and allopathic drugs in common ailments among rural population. It is a big experiment creating cadre of workers to look after the health needs of the rural millions. It will take some time to assess its impact and success.

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